

**STATUS OF THE CRAWFISH FROG (*RANA AREOLATA*) IN
ILLINOIS, YEAR 1: LOCATE AND EVALUATE HISTORIC
COLLECTION/OBSERVATION LOCALITIES**



Prepared by:

John G. Palis
Biological Consultant
P.O. Box 387
Jonesboro, IL 62952

Prepared for:

Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702

June 2007

INTRODUCTION

The crawfish frog is a relatively large (up to 11 cm body length) ranid frog that inhabits crawfish and small mammal burrows outside the breeding season (Smith 1961). In Illinois, crawfish frogs breed in late winter-early spring, from late February or early March through April, depending upon location, temperature, and rainfall. The breeding season at any one locality is abbreviated, typically lasting less than a month. Breeding activity is closely associated with relatively warm temperatures and ample rainfall. Breeding sites are typically open-canopy wetlands embedded within prairies, woodlands, oldfields, pastures, hayfields, orchards, golf courses, or croplands having hardpan clay soils (Figure 1). The hydrology of breeding sites varies from ephemeral, semi-permanent, or permanent; however, predaceous fishes are typically absent from permanent wetlands used by crawfish frogs.

Figure 1. Examples of crawfish frog breeding sites in Illinois (clockwise from upper left): 1) Crab Orchard National Wildlife Refuge, Williamson County (May 2007); 2) Crab Orchard National Wildlife Refuge, Williamson County (May 2007); 3) Prairie Ridge State Natural Area, Jasper County (November 2006); Grassy Slough Preserve, Johnson County (October 2006).



The crawfish frog is considered vulnerable and possibly declining in abundance and occurrence in the adjacent states of Indiana, Iowa, Kentucky, and Missouri (Christiansen and Bailey 1991, Minton 2001, Missouri Department of

Conservation 2007, Kentucky Department of Fish & Wildlife Resources 2007). Although the conservation status of the crawfish frog in Illinois is unknown, it is thought that the species is declining as a result of habitat loss and fragmentation, especially through the loss of wetlands or the loss of the use of wetlands through the introduction of predatory fishes. Most occurrence records for the crawfish frog in Illinois are greater than 25 years old, and nearly all recent records are limited to southern Illinois (i.e., Jackson, Williamson, and Saline counties, southward; Phillips et al. 1999). The crawfish frog is recognized as a species in greatest need of conservation in the Illinois Comprehensive Wildlife Conservation Plan (Illinois Department of Natural Resources 2005).

Understanding the current conservation status of the crawfish frog in Illinois requires several steps: 1) determine all known historic locations for the species through queries of museum collections and individuals familiar with the species, 2) visit all historic sites that can be relocated and evaluate present habitat condition, and 3) revisit all known sites, as well as other potentially-inhabited nearby sites, during the breeding season to determine presence or absence of crawfish frogs. Herein, I summarize my efforts to address steps one and two as an initial measure to determine the species' status within the state of Illinois.

METHODS

Historic records were obtained from museum collections, published literature, unpublished reports, and knowledgeable individuals. In addition, I requested locality records from Illinois heritage biologists, district wildlife biologists, and nature preserve biologists within the range of the crawfish frog in Illinois. The following collections provided crawfish frog records: Auburn University (AU), California Academy of Sciences (CAS), Chicago Academy of Science (CA), Field Museum of Natural History (FMNH), Florida Museum of Natural History (UF), Illinois Natural History Survey (INHS), Illinois State Museum (ISM), Louisiana State University Museum of Natural Science (LSUMZ), Smithsonian Institution (USNM), Southern Illinois University at Carbondale (SIUC), Texas Cooperative Wildlife Collection (TCWC), Tulane University (TU), University of Illinois Museum of Natural History (UIMNH), and University of Michigan Museum of Zoology (UMMZ).

Prior to initiating field assessments, I organized all historic observations by county. I then selected pertinent topographic maps from the map section of Morris Library, SIUC. I used these topographic maps in the field to locate landscape features (e.g., ponds) I wished to examine at/near historic records. If accessible (e.g., on public land), I closely examined wetlands/ponds. If not, I examined sites from a distance or up close with landowner permission. I acquired latitude and longitude (NAD 83) for intriguing sites using a global positioning system unit (Garmin Etrex Legend). Upon returning from the field, I checked the accuracy of my gps points at www.topozone.com. For historic observations in close proximity to each other, I gave precedence to locating

observations of frogs at breeding sites over those observed on the road. When more precise records were available, I did not attempt to track down sites with vague collection data (e.g., "Carbondale"). For collections simply labeled with the name of a small town, I examined the periphery of the town. I've summarized my observations alphabetically by county.

RESULTS

Adams County: one site. One specimen collected in 1956 by Parmalee from a "farm house yard, 1 mile west of Camp Point" (ISM 626174). I investigated this site on 25 September 2006. I located a small pond, which was dry, on the S side of highway 24 just west of Camp Point, and 0.3 miles east of road 2200E (40°02.409N, 91°04.970W; taken on the road). The pond is within an extensive cattle pasture near a farm house. Elsewhere, the uplands consist of cropland. The combination of a seasonally-dry pond and grassland suggests potential for continued persistence of *Rana areolata* at this location.

Alexander County: one site. One specimen collected in 1995 by Redmer and Tolch, "1.5-2.0 kilometers northwest of Diswood on Diswood-McClure Road" (SIUC 5508). I examined the area on 13 December 2006. Diswood-McClure Road passes through the flat valley of, and runs nearly parallel to, Sandy Creek. The valley is devoted to agriculture and includes cattle pastures, cropland, and fescue fields. To the east and west the land rises abruptly into forested hills. The Tamms topographic map indicates two inaccessible small ponds west of the creek. I passed by two muddy-water pasture ponds near the road, one 0.6 mile north of Diswood and the other 0.65 mile north of Diswood. The pond 0.6 mile north (west side of road in an overgrazed feedlot) is large and likely contains predatory fish, which would render it unsuitable for *Rana areolata*. The pond on the east side of the road, 0.65 mile north, however, looks more promising. This small pond, in a small fescue pasture between two barns, is likely fishless and potentially suitable for *Rana areolata* (37°14.346N, 89°19.682W; taken on the road).

Bond County: one site. Specimens collected in 1956 by Smith and Selander, "1 mile N of Mulberry Grove" (INHS 8090-8091). The majority of the land near Mulberry Grove is flat and devoted to row-crop agriculture. However, in the vicinity of Owl Creek north of Mulberry Grove, there is more topographic relief and the land supports a mix of cropland and forest. I located one small pond that may have potential as a *Rana areolata* breeding site. The pond is located in a small pasture near a house, on the south side of Old Park Avenue (1325N; 38°55.916N, 89°17.415W). More pasture occurs north and south of the road. The pond was nearly dry when I saw it on 26 September 2006. The seasonally-dry pond within grassland provides potential habitat for *Rana areolata*.

Clay County: one site. Specimens collected in 1966 by Burley “in a farm pond 2-3 miles from Winterrowd” (Effingham County; TU 28376-28378). I searched for this site on 26 September 2006. The area is topographically flat and devoted to crop production. I could not find any existing ponds or wetlands. One pond indicated on the topographic map (38°54.240N, 88°22.736W) no longer exists, having been converted to a grassy drainage swale between a corn field and soybean field. The area appears to provide little or no opportunity for the continued persistence of *Rana areolata*.

Coles County: three sites. **1)** Specimens collected in “Charleston” by Smith in 1947 (INHS 1899-1900, 1949); **2)** specimen collected in “Diona” by Smith in 1948 (INHS 2846); **3a)** Specimens collected in 1949 by Smith “7 miles south of Mattoon” (INHS 3844-3851); **3b)** Specimens collected in 1949 by herpetology students “7.2 miles south of Mattoon” (INHS 5010-5015, 5243-5248); and **3c)** specimen collected in 1949 by Shannon “7.0-7.2 miles S of Mattoon” (UIMNH 7264).

I investigated these sites on 28 September 2006. I began “7.0-7.2 miles S of Mattoon.” The area is vast sea of corn and soybeans. I located two sites that have low potential as *Rana areolata* habitat. The first is a pair of tall nitrogen storage tanks behind chain-link fencing on the north side of Trilla Road (county line), 0.1 mile east of highway 45/121 (39°22.446N, 88°22.585W; taken on the road). Because the tanks are encircled by grass berms, water may pool around the tanks and provide breeding habitat for *Rana areolata* as at the Patoka Tank Farm in Marion County. The second site is a wide, grassy roadside ditch on the east side of highway 45/121, 0.25 mile north of Trilla Road (39°22.687N, 88°22.700W). The only non-cropped upland is the road shoulder planted to fescue, the nearby tank farm, and a house/lawn across the road.

For the collection labeled “Charleston,” I explored the area southwest of the city where topographic relief provided the opportunity for the existence of non-cropland. Despite the topographic relief, the area is overwhelmingly devoted to row-crop agriculture. Areas too steep to farm, however, are wooded and dotted with houses. I did observe upland habitat potentially suitable for *Rana areolata* (small horse pastures, oldfields, and fescue hayfields), but did not encounter potential breeding habitat. In general, the area has low potential to support a *Rana areolata* population.

Diona is a very small collection of homes and businesses on the Coles County – Cumberland County line. In addition to extensive cropland nearby, there is a cattle pasture south and west of town and an oldfield east of the pasture. The pasture is low in the landscape and is bisected by Clear Creek (a small ditch with eroding banks). The pasture appears to provide suitable upland habitat for *Rana areolata*. However, I did not observe any potential breeding habitat. Should breeding habitat exist, then *Rana areolata* may still occur here.

Crawford County: one site. Specimens collected in 1956 by Smith and Clark “0.5 mile south of Trimble” (INHS 8101-8102). I examined the area on 27 September 2006. At 0.5 mile south of Trimble, highway 1 passes through extensive soybean fields. East of highway 1 at 0.2 mile south of Trimble is, according to the 1987 (photo-revised) Hutsonville topographic map, a pond adjacent to a stream. I could see a bulge in the forested riparian corridor flanking the stream, but was unable to gain access and determine whether or not a pond still exists (39°03'08.9"N, 87°41.069'W; taken on the road). Even if the pond does exist, the area shows little potential for inhabitation by *Rana areolata* given the prevalence of intensive, row-crop agriculture practiced at this location.

Cumberland County: seven sites. **1)** Specimens collected in 1940 by Smith “2 miles south of Toledo” (INHS 2100-2101); **2)** Specimen collected in 1948 by Smith “4 miles northeast of Neoga” (INHS 2872); **3)** Specimen collected in “Neoga” by Burger in 1949 (INHS 3843); **4)** Specimen collected in 1950 by Smith et al. “7 miles northwest of Toledo” (INHS 5190); **5)** Specimen collected in 1940 by Smith “1 mile south of Toledo” (FMNH 37863); and **6)** Specimen collected in 1955 by Parmalee “6 miles southeast of Neoga” (ISM 626173); **7a)** Specimens collected in “Greenup” in 1948 by Smith (INHS 3368-3369); and **7b)** Specimen collected in “Greenup” by Smith in 1949 (INHS 12033)

I searched for Cumberland County sites on 27 and 28 September 2006. I could not find any potential *Rana areolata* habitat in or near Greenup. Where topographically level, the land is dedicated to crop production. In areas with greater topographic relief, the hills and slopes are heavily wooded and have permanent fish ponds and scattered homes. In areas having oldfields or hayfields, I could not find potential breeding sites.

The area “1 mile and 2 miles south of Toledo” consists principally of cropland. I located a small pond in a small horse pasture east of 1225E, 0.4 mile south of 550N (39°14.730'N, 88°14.620'W; taken on the road). The only portion of the pond visible from the road is the dam. As this is the only possible site for *Rana areolata* I observed, I believe the area has little potential to support a population of *Rana areolata*.

The area “7 miles northwest of Toledo” has been extensively modified for crop production. I could find only two ponds. The first is within an extensive soybean field west of 700E, 0.4 mile south of 1200N (39°20.363'N, 88°20.530'W; taken on the road). The other is on the west side of 700E, 0.1 mile south of 975N (39°18.682'N, 88°20.482'W; taken on the road). This small, permanent pond is within a small pasture and likely contains fish. Due to extensive cropland and seemingly unsuitable breeding sites, this area shows poor potential for the continued existence of *Rana areolata*.

The area “6 miles southeast of Neoga” is in the vicinity of Brush Creek. Here, the topography is rolling. I found a farm pond in a severely-eroded cattle pasture

north of 600N, about 0.9 mile west of 500E. I was unable to view the pond up close, but from the road I could see that it contained emergent herbaceous vegetation (39°15.489N, 88°23.753W; taken on the road). Elsewhere, I talked with the owner of Figgins Family Farm, an extensive cattle pasturing operation on the east side of 500E, south of highway 121 and north of Brush Creek. He said that all the cattle watering ponds contained fish. I observed another small farm pond on the south side of 550N, 0.4 mile east of 275E (39°15.061N, 88°24.729W; taken on the road). When observed, the basin was only ¼ full and well-vegetated with water primrose. The pond is within a small fescue field near a house. Cropland extends beyond the field/house complex in all directions. Overall, the area has limited potential for *Rana areolata*.

The small town of Neoga is nearly lost in the vast sea of corn and soybeans that surround it. There appears to be no suitable *Rana areolata* habitat in or immediately near Neoga.

I then searched “4 miles northeast of Neoga.” Here, again, I came upon extensive fields of soybeans and corn. However, I did find the remnants of a farm pond within a soybean field east of highway 45 (and east of railroad tracks), 0.8 mile south of highway 121 (39°21.140N, 88°23.304W). The pond dam has been broken, and the pond obviously no longer holds water. However, I did locate a short length of ditch that drains southward from the pond that obviously does hold water for a period of time. The ditch borders a narrow band of fescue on one side and a narrow band of woods on the other. Although this ditch may provide breeding habitat for some species of amphibians, it seems unlikely that the hydrology would be long enough for *Rana areolata*. Thus, this area has little potential to support an extant population of *Rana areolata*.

Edgar County: one site. Specimens collected in 1956 by Smith and Clark “1 mile north of Oliver” (INHS 8098-8099). I searched for this site on 27 September 2006. I found a small pond just east of highway 1, about 1 mile north of Oliver (0.1 mile south of 150N) in an unkempt yard/small horse pasture (39°29.830N, 87°40.848W; taken on the road). From the road, the pond is only evident by the presence of emergent cattails. Immediately east of the pond is a field of corn, and beyond that is an extensive, rolling cattle/horse pasture. The pasture borders the south side of 150N, and extends from 0.3-0.8 mile east of highway 1. The pasture includes low, wet ground adjacent to Mud Creek, and appears to provide suitable upland habitat for *Rana areolata*. Should this be the case, and should the pond also prove suitable, then this site could still be inhabited by *Rana areolata*.

Fayette County: one site. Specimens collected in 1956 by Smith and Selander “3 miles northwest of Vandalia” (INHS 8092-8093). I investigated this area on 26 September 2006. Nearly all level land in this area is dedicated to crop production. I located a small, shallow pond within a low-lying horse pasture on the south side of 1700N, 0.1 mile east of 600E (38°59.069N, 89°08.177W taken

on the road). The small pond and grass pasture provides potential habitat for *Rana areolata*.

Franklin County: one site. One specimen collected crossing a road in Wayne Fitzgerald State Park (WFSP) in 2006 by Dolan and Lamer (James Lamer, personal communication 2006; INHS 20030). I examined WFSP in the vicinity of the *Rana areolata* collection locality on 22 September 2006. I examined three small ponds. The upland habitat surrounding the ponds is a mix of oldfields, croplands, and young deciduous woods. Two ponds are in open fields and both are encircled by a narrow ring of trees (38°06.471N, 88°55.378W and 38°06.388N, 88°55.493W). Each was dry during my visit. Due to shading, the basins do not support herbaceous vegetation. The third pond, within woods (38°06.202N, 88°55.990W), was approximately $\frac{3}{4}$ full of water when inspected. This pond also lacks herbaceous vegetation due to shading. Due to the lack of herbaceous vegetation, none of these ponds provide ideal *Rana areolata* larval habitat. Whether *Rana areolata* use any of these ponds for breeding is unknown. If not, there must be low areas within the oldfield habitat that flood and hold water the length of the frog's larval period. I did see such a low area (flooded during my visit) in the oldfield across the road, N of the woodland pond.

Hamilton County: two sites. 1) Specimen collected in 1958 by Smith "1 mile east of McLeansboro" (INHS 8761); 2) Specimen collected in "Delafield" by Smith in 1958 (INHS 8762). I investigated these sites on 22 September 2006.

The tiny community of Delafield is nearly lost in the sea of cropland surrounding it. The only wetland I found in town was a partially wooded low area on the east side of town, south of highway 142. However, it was obvious by the orientation of the debris that water drains through, rather than pools, in the basin. I also spied a buttonbush-edged pond on the south side of highway 142 east of Delafield, adjacent to riparian woods. Although I could not get a good look at the pond (no place to pull over), it did not look very promising for *Rana areolata*. I did, however, locate a potential *Rana areolata* breeding site east of Delafield, north of highway 142 (38°08.799N, 88°35.666W). When examined, this shallow-basin pond had shallow water over about $\frac{1}{4}$ of its basin, from which *Rana catesbeiana* metamorphs were emerging. This old farm pond is bordered by a cropland and a woodlot. In addition to grasses at the perimeter, about $\frac{3}{4}$ of the pond basin is covered by water primrose. I observed crawfish burrows in the adjacent oak-dominated woodlot (many trees were killed in a fire). This site shows potential as a *Rana areolata* breeding site and warrants visitation during the frog's breeding season.

Despite the rolling topography "1 mile east of McLeansboro," the land is used principally for crop production. I located a pond on the topographic map north of an unnamed gravel road, about 1 mile east of town. The small pond is very near a house. The homeowner, Pat Thomas, kindly let me examine the pond. The pond's steep banks are overgrown with Japanese honeysuckle and blackberry.

The bottom of the basin is vegetated with grasses (38°05.868N, 88°30.658W). When examined, the pond was nearly dry. The pond is immediately bordered by a narrow band of trees (red maple, catalpa, and sycamore). Beyond this forested zone is the yard and an open field vegetated by fescue, purpletop, and broomsedge. According to Mr. Thomas, the pond is used by frogs. I imitated the snoring call of *Rana areolata* and he said he has heard that call coming from the pond in early spring. This is certainly another site that warrants a visit during the *Rana areolata* breeding season.

Hardin County: one site. Frog(s) observed in “Elizabethtown” by Smith (1953). I visited Elizabethtown on 4 April 2007. I located a shallow, grassy pond at the low end of a fescue field, south of highway 146 on the east side of town (37°27.005N, 88°18.082W). The pond is downslope of a small cemetery and the town’s water tower. Based on water depth and lack of aquatic vegetation, I suspect the hydrology of this site may be too short for the *Rana areolata* larval period. On the northwest edge of town, adjacent to Justin Livingston Memorial Park, is an extensive cattle pasture, as well as some cropland, on low-lying and gently rolling ground. I did not observe any ponds. However, if a pond occurs in the pasture, this area could be inhabited by *Rana areolata*.

Jackson County: fifteen sites. **1)** Specimens collected “near Elkhaville” in 1938 by Kristan (SIUC 2625-2526); **2a)** specimen collected in “Carbondale” by Peithman in 1938 (SIUC 2630); **2b)** specimens collected in “Carbondale” in 1939 (SIUC 2609-2610, 2631) by Cagle and associates; **2c)** specimen collected by Howell in “Carbondale” in 1956 (SIUC 1867); **2d)** specimen collected in 1961 in “Carbondale” by Folkerts (AU 1989); **3a)** specimens collected at “Carbondale reservoir” by Cochran and Cagle in 1940 (SIUC 2623-2624); **3b)** specimen collected in 1961 by Myers “2 miles south of Carbondale” (UF 14722); **4a)** specimen collected by Keiser near “New Thompson Lake, between Carbondale and Murphysboro” in 1955 (LSU 69014); **4b)** specimen collected in 1956 at “rearing pond near New Thompson Lake, 2 miles northwest of Carbondale” by Crouse (SIUC 115); **5a)** specimen collected by Swanson “1 mile east of Carbondale” in 1958 (LSU 69016); **5b)** specimen collected by Brandon and Altig in 1966 on “old route 13, 0.5 mile from junction of new highway 13, east of Carbondale” (SIUC 2820); **5c)** specimen collected by Redmer in 2003 in “Carbondale, east of South Lewis Lane” (INHS 18796); **5d)** frogs observed by Redmer in early 1990s on East Walnut Street near entrance to bowling alley (Redmer, personal communication 2006); **6a)** specimen collected in 1961 by Myers “3 miles northeast of Carbondale” (UF 16833); **6b)** Frogs heard calling in 2006 by Donovan Henry (personal communication 2006) north of Reed Station Road, 0.4 miles east of Hill Road; **7)** Ron Brandon (personal communication 2006) heard frogs calling in 1964 from a pond at Evergreen Terrace, Carbondale; **8)** Ron Brandon (personal communication 2006) heard frogs calling from roadside ditch along old highway 13 at Crab Orchard Creek (east of Giant City Road) in 1968; **9)** specimen collected in 1968 in “Murdale housing area, Carbondale” by Brandon and Besharse (SIUC 2859); additional observations of

frogs at this site by Brandon through 1978 (Brandon, personal communication 2006); **10**) specimen collected by Redmer in 2003 at “junction of East Grand and Giant City Road, Carbondale” (INHS 18795); **11**) frog observed by Redmer in early 1990s in the bend of East College Street, west of South Lewis Lane; **12**) frogs heard calling in early 1990s from a depression in field on north side of nursing home, west of South Lewis Lane; **13**) frogs heard calling north of Reed Station Road, 0.15 mile east of Hill Road by Donovan Henry (personal communication 2006) in spring 2006; **14**) frogs heard calling north of former railroad grade, 0.2 mile west of Clark School Road, 0.5 mile south of Reed Station Road by Donovan Henry (personal communication 2006) in spring 2006; and **15**) frogs heard calling at pond south of Mary Nells Lane, 0.2 mile east of Giant City Road in 2004 by Fairbairn and Lips (2004).

I examined sites in Jackson County on the following dates: 20 September 2006, 21 September 2006, 13 October 2006, 16 January 2007, 24 March 2007, 28 March 2007, and 15 April 2007.

On 20 September 2006, Donovan Henry showed me three *Rana areolata* breeding sites that occur approximately 4 air miles southeast of the junction of highway 51 and highway 149 in De Soto. The first pond is within a cornfield behind a house on the north side of Reed Station Road, 0.15 mile east of Hill Road (37°47.106N, 89°10.078W; taken on road). This pond was not visible due to the height of the corn. The upland habitat in the area consists principally of cropland, but also includes scattered homes and associated lawns.

The second pond is located north of Reed Station Road, 0.4 mile east of Hill Road (37°47.102N, 89°09.800W; taken on road). This site is a relatively large, man-made, willow-lined, permanent pond within an oldfield vegetated with a variety of grasses and forbs. There are a variety of small trees and autumn olive throughout the oldfield. According to Donovan, the frogs breed in a low, graminaceous area at/near the north edge of the pond. This site is in the vicinity of Myers' 1961 record “3 miles northeast of Carbondale.

The third site is on the north side of a former railroad grade, 0.2 mile west of Clark School Road, and 0.5 mile south of Reed Station Road (37°46.768N, 89°10.195W). The shallow basin (nearly dry when examined) is treeless and vegetated with cocklebur, smartweed, and a grass (*Echinochloa*). The basin is at the low end of a cornfield and the edge of mesic deciduous woods.

On 21 September 2006, I examined the area “near Elkville” where frogs were collected in 1938. I began south of Elkville near the community of Hallidayboro. I examined a dry, leaf-littered, heavily-shaded (surrounded by pin oak, red maple and slippery elm) pond basin within a soybean field behind (west of) the Methodist Church (37°53.456N, 89°14.476W). Although certainly not an ideal site due to shading, this pond could be used by *Rana areolata* for breeding. I also investigated an area just north of Hallidayboro, west of the railroad tracks.

According to the topographic map, there was a suite of temporary ponds here. All I found, however, was an extensive soybean field with ditches where the ponds once occurred (37°53.671N, 89°14.151W).

I then investigated an area about 0.5 mile east of Elkhart, north of the sewage treatment facility. I found a small, dry wetland within a large woodlot (37°54.794N, 89°13.424W). The basin is vegetated with buttonbush, cocklebur, and clearweed. Like the site in Hallidayboro, this one is less than ideal for *Rana areolata*. Nonetheless, it may warrant a return visit during the frog's breeding season. I located a second small pond in the woods, just east of the buttonbush pond. This pond was about half full and the water was covered with duckweed. It is edged by smartweed and swamp cottonwood. Numerous *Rana catesbeiana* metamorphs were emerging from the water. This is another site with low potential for *Rana areolata*. The topographic map indicated a pond north of the woodlot in a cropfield. However, all that remains is a low, wet spot. This low spot did not appear to have a long hydroperiod.

I also looked south-southwest of Hallidayboro in the northeast corner of the Vergennes topographic map. According to the map, the area is pocked with numerous ponds. However, the ponds no longer exist, having been drained by a series of ditches.

On 13 October 2006 I investigated the "Carbondale reservoir" where Cochran and Cagle collected frogs in 1940. Presently, the reservoir does not provide suitable breeding habitat for *Rana areolata*. It is unknown whether the frogs collected in 1940 were actually taken in the reservoir or nearby. According to James Swayze, Water Operations Manager for the city of Carbondale (personal communication 2007), the reservoir was first used for water in 1926. It seems doubtful that 14 years later the reservoir was fishless and suitable for *Rana areolata* reproduction. Although this cannot be entirely ruled out, it seems more probable that Cochran and Cagle recorded the collection locality as the Carbondale Reservoir simply because it was the closest landscape feature. This collection locality may be close to or the same as Myers' 1961 collection, "2 miles south of Carbondale." I examined a series of former fish-rearing ponds below the dam at the east end of the reservoir, near the south side of Pleasant Hill Road. The small, rectangular ponds vary in hydrology; some are temporary (i.e., dry), others are semi-permanent (holding very little water), and the remainder are permanent (holding water over the entire basin). They also vary in amount and type of vegetative cover. Some ponds are well-vegetated throughout with graminoids and/or forbs, whereas in other ponds herbaceous vegetation is limited to the perimeter. Some basins have small trees in and/or on the perimeter. All ponds appear to be fish-free. I took a gps point near the center of the pond complex (37°42.001N, 89°13.264W). If *Rana areolata* persisted in the area when these ponds contained fish, they may have since colonized the ponds after the fish were extirpated. Most, if not all, of these former fish ponds now provide suitable breeding habitat for a variety of frog species, including crawfish

frogs. This site definitely warrants a visit under the appropriate weather conditions in early spring.

I then looked for the pond at Evergreen Terrace where Ron Brandon heard *Rana areolata* calling in 1964. No pond exists at this location today. All I found was a shallow ditch that drains water northward, under Pleasant Hill Road, to a nearby stream. Because Brandon indicated that he heard other male *Rana areolata* "calling in the distance" from this locality, I searched for other potential breeding sites nearby. I located a small, dark-water woodland pond in the forest north of Evergreen Terrace (37°42.120N, 89°14.032W). The pond is heavily shaded by surrounding trees and looks unsuitable for *Rana areolata*. I attempted to find a pond indicated on the topographic map, about 0.75 mile northwest of the Evergreen Terrace site (near the SIU Press). This pond no longer exists, having been drained by a cut through the dam (37°42.534N, 89°14.448W). Despite the rural nature of the area (SIU farms), *Rana areolata* may have been extirpated by the loss of breeding habitat.

On 17 January 2007, I investigated sites on the east side of Carbondale where *Rana areolata* was observed in the late 1950s and mid 1960s, then again in the early-mid 1990s and early 2000s. I began by examining a low area in a field on the west side of South Lewis Lane across the street from the entrance to low-income housing. Due to recent rains, the low area was flooded (pool was about 14 yards x 28 yards) with shallow water (estimated to be < 4 inches; 37°43.356N, 89°11.992W). The pool is within a large mowed field bordered by a nursing home on the south, housing to the west and north, and South Lewis Lane on the east. More housing occurs east of the road. Mike Redmer (personal communication 2006) heard a loud chorus of *Rana areolata* at this site in the early 1990s. It is not known if the character of this site has changed or not, but based on the lack of wetland vegetation and water depth, I suspect the hydrology of the pool is not long enough for the successful metamorphosis of *Rana areolata* tadpoles. On 30 January 2007, I passed this site; it was already dry. Obviously this pool is unsuitable for successful *Rana areolata* reproduction.

I then looked for a small pond indicated on the 1996 Carbondale topographic map as occurring at the west end of "The Fields" apartment complex. The pond is 0.1 mile southeast of the spot on College Street where a frog was observed by Redmer in the early 1990s. This pond no longer exists, having been replaced by a playground (37°43.196N, 89°12.156W). The only potential remnant of the pond is a large willow tree that may have grown adjacent to the pond. A rock riprap-lined ditch occurs just to the south. A woman at the apartment complex office said the pond was filled about 10 years ago. However, she claims it was a swimming pool, not a pond. The topographic map clearly shows it as a pond. The historic suitability of this pond as a *Rana areolata* breeding site is unknown.

I also attempted to find a very small pond indicated on the topographic map as occurring on the west side of the terminus of South Cedarview Street,

approximately 0.1 mile west-northwest of the pool in the field near South Lewis Lane. The pond has been destroyed, having been converted to a parking lot for Tatum Heights Park (Carbondale Park District). In general, the area west of South Lewis Lane, between route 13 to the north and East Grand Avenue to the south, appears no longer suitable for *Rana areolata*. Although large expanses of mowed, grassy fields still exist, potentially providing terrestrial habitat for *Rana areolata*, suitable breeding sites are lacking. With the exception of the shallow pool in the field on the west side of South Lewis Lane, excess water no longer pools as it is now carried off by several ditches. Nocturnal vocalization surveys at the field pool during the *Rana areolata* breeding season will be necessary to determine if the species has been extirpated from this area.

In the early 1960s, George Folkerts observed crawfish frogs east of the 500-600 block of Wall Street, Carbondale (Folkerts personal communication, 2006). His specimen is simply labeled "Carbondale." Other sites labeled "Carbondale" (SIUC 2630, 2609-2610, 2631, 1867) may or may not correspond to Folkerts' collection site. However, these collections are too vague to relocate. Folkerts' site is very close to Redmer's observation of a frog on College Street. On 15 April 2007, I examined habitat on the east side of Wall Street at the 500 and 600 blocks. The entire 500 block is developed. On the east side of the 600 block of Wall Street, however, is a low, mowed field south of the Victory Christian Fellowship and west of Piles Fork Creek. However, there is no wetland here. East of Piles Fork Creek, north of Pinch Penny Pub and west of "The Fields" apartments, is a low, mesic woods. The forest, comprised of red maple, black cherry, pin oak, and sycamore, has a dense understory of bush honeysuckle. Although undeveloped, and potentially providing upland habitat for *Rana areolata*, I did not find an extant breeding site. *Rana areolata* is likely extirpated from this area.

Redmer heard frogs calling from an unknown location east of South Lewis Lane, behind the bowling alley (personal communication 2006). He also collected a specimen from the area in 2003 (INHS 18796). In addition, Redmer observed *Rana areolata* on Walnut Street, between the Carbondale Mall to the north and the bowling alley to the south. In 1966, Brandon and Altig also collected a specimen in the vicinity of Redmer's observations on Walnut Street (SIUC 2820). Even earlier, Swanson collected a specimen "1 mile east of Carbondale" (LSU 69016) in 1958. Swanson's locality likely corresponds to that of later collectors. As recently as 1996 (1996 Carbondale topographic map), the central and northeastern portion of the area encompassed by South Lewis Lane on the west, Walnut Street on the north, East Grand Avenue on the south, and Giant City Road on the east, was undeveloped. Relatively little undeveloped land now exists in this area. The central portion has been converted to a large sports field complex and the Carbondale High School has been relocated just southwest of the junction of Giant City Road and Walnut Street. I examined the vicinity of the sports field complex, which is behind (south of) the former bowling alley (now an indoor soccer facility). I found a marshy area that has formed behind a small

beaver dam constructed across a small stream that flows northward (37°43.260N, 89°11.564W). The area is vegetated with a mix of upland and wetland vegetation including cattails, *Phragmites* (two relatively small patches), broomsedge, *Juncus*, and young ash, willow, and red cedar. The wetland is bordered by a parking lot to the north, sports fields to the east and west, and housing to the south. It's suitability as a *Rana areolata* breeding site is unknown and should be investigated during the frog's breeding season.

Redmer's observation of *Rana areolata* on Walnut Street at late as the early 1990s is peculiar given the presence of the Carbondale Mall on the north side of the road. There were, however, four ponds south of Walnut Street and east of the road to the indoor soccer facility at this location as recently as 1996 (1996 Carbondale topographic map). Today, none of these ponds exist. It appears that at least three of these ponds are now part of a large, deep-water impoundment between the indoor soccer facility and the Carbondale High School sports field. The suitability of any of these former ponds for *Rana areolata* reproduction is unknown; however, it seems likely that at least was one suitable given the proximity of frogs on the road.

In 2003, Redmer collected a frog (INHS 18795) at the northwest corner of the junction of Giant City Road and East Grand Avenue. This junction is bordered by houses west of Giant City Road, and a school and houses on the east side of Giant City Road. Beyond the buildings adjacent to the roads, the land is still open field. Southwest of this junction is an expansive, broomsedge-dominated oldfield. Mowed grassy fields on rolling topography lie beyond the buildings to the east. To the northwest, a narrow mowed grassy field occurs between houses along East Grand Avenue to the south and Meadowbrook Lane to the north. A low, mesic ash and red maple-dominated woods occurs behind the houses along the north side of Meadowbrook Lane. I examined a pond in these woods, about 0.25 mile north-northwest of the junction of East Grand Avenue and Giant City Road (37°43.260N, 89°11.238W). The open-canopy, permanent-water pond lacks emergent herbaceous vegetation and is an unlikely *Rana areolata* breeding site. A known extant *Rana areolata* breeding site occurs approximately 0.35 mile north-northeast of the junction of East Grand Avenue and Giant City Road. This pond is south of Mary Nells Lane, 0.2 road mile east of Giant City Road (37°43.325N, 89°10.926W). The small pond is edged with trees (willow, pin oak, sassafras) and is within a small field of fescue. The field borders a cropfield to the south. There are widely scattered house elsewhere in the vicinity. *Rana areolata* was first heard at this pond in the early 1990s by Alan Wilson (Redmer, personal communication 2006). Although Wilson stated he heard *Rana areolata* chorusing at this site, Redmer never heard more than one or two frogs calling at a time during his visits. Similarly, Fairbairn and Lips (2004) never heard more than one male calling at this site. I heard but one male *Rana areolata* calling here in March 2006. These observations suggest that the *Rana areolata* population using this pond may be small. The possibility exists that the frog

observed by Redmer at the junction of Giant City Road and East Grand Avenue was moving to/from this pond.

On 25 March 2007, I examined the Parrish Park area of Carbondale where Ron Brandon heard *Rana areolata* in the late 1960s. I located two small, shallow, thickly-vegetated (grass) pools in a fescue field north of Parrish School (east of North Parrish Lane and south of Murphysboro Road), just north of an east-west trending ditch (37°43.757N, 89°14.953W). Due to general lack of obligate vegetation and shallow water (< 8 inches), it is unlikely that either pool holds water long enough to permit transformation of *Rana areolata* tadpoles. Although I observed eggs of *Rana sphenoccephala* and *Bufo americanus* in the nearby ditch, I saw none in either pool. I also examined a pool south of Sunset Drive about 50 yards west of Little Crab Orchard Creek (37°43.460N, 89°14.841W). The shallow, elongate pool is shaded by river birch, ash, and autumn olive. As a result, it contains no herbaceous vegetation. I did observe egg masses of *Rana sphenoccephala*, *Pseudacris triseriata*, and *Ambystoma texanum*. Despite the presence of these species, I do not believe this site is suitable for successful *Rana areolata* reproduction. Given the network of drainage ditches associated with the soccer fields here, and the fact that Brandon no longer hears crawfish frogs calling, it is likely this area is no longer inhabited by *Rana areolata*.

On 28 March 2007, I examined the area in the vicinity of New Thompson Lake, northwest of Carbondale, and Ron Brandon's 1968 site near Crab Orchard Creek east of Carbondale. I began at the "New Thompson Lake" site. Frogs were collected from the vicinity of New Thompson Lake in 1955 and 1956. Although Edmund Keiser's 1955 collection is labeled "New Thompson Lake," he communicated to me (2006) that the lake itself was not the collection site. The data with the 1956 collection says "rearing pond, near New Thompson Lake." I drove west from New Era Road, on East Lake Road (which passes by the north side of the lake). There is extensive pasture (horse?) on the south side of the road, from New Era Road nearly to the entrance to the New Thompson Lake housing area, 0.25 mile west of New Era Road. There is a pond in the western pasture (sparsely wooded with oaks, hickories, and white pines), about 0.1 mile south of the road (0.25 mi W of New Era Road). It is too far away to assess. There is also extensive, rolling pasturage north of East Lake Road. I saw no cattle, so it may be used for hay production now. There is a farm pond about 0.1 mile north of East Lake Road, 0.1 mile west of New Era Road. It is within either pasture or fallow cropland. The sign on the fence reads, "Illinois acres for wildlife." I was able to get a gps point fairly close to the pond from the old RR bed north of the property: 37°44.808N, 89°14.842W. The pond has cattails on the shallow south side. If fish-free, it has potential for *Rana areolata*. I could not find a smaller pond indicated on the topographic map as occurring about 0.15 mile to the west. It may have been drained. A larger pond indicated on the map further west, adjacent to the north side of East Lake Road, about 0.1 mile east of Joshua Road, has been drained. Here, on the fence, I saw another "Illinois acres for wildlife" sign. I drove north on Joshua Road (dead end) from East Lake Road.

There is a large sewage lagoon on the west side of Joshua Road, 0.1 mile north of East Lake Road. It does not look suitable for crawfish frogs. East Lake Road joins Highway 13. The rolling ground west of Highway 13 is principally suburban, with new homes scattered among woodlots and former pastures. This area is unsuitable for crawfish frogs. Although the uplands near New Thompson Lake look good for *Rana areolata*, breeding habitat may be a limiting factor. Nonetheless, the area warrants a visit under appropriate meteorological conditions during the frog's breeding season.

I then drove east of Carbondale on old highway 13 to Brandon's 1968 site labeled, "ditch along old highway 13 east of Carbondale at Crab Orchard Creek." I investigated the roadside ditch on the north side of the highway (no ditch on south side), about 0.5 mile east of the creek crossing (37°43.976N, 89°10.117W). The wide (to about 8 yards) ditch is very eutrophic, undoubtedly receiving runoff from the adjacent cropland on the north side. It is thickly vegetated with algae, smartweed, *Rumex*, and *Carex*. In addition, buttonbush grows in the ditch, and red maple and sweetgum flank the south side of the ditch (i.e., between ditch and road). Also plenty of leaf litter in the ditch from the trees. I saw small fish in the ditch, as well as adult *Rana sphenoccephala*. The ditch undoubtedly receives fish input whenever Crab Orchard Creek overflows its banks. I saw numerous large crawfish burrows at the base of the road shoulder to the east of the water-filled ditch. There is more, extensive cropland south of the road. The ditch seems like an unlikely *Rana areolata* breeding site. There is a waste-water treatment plant to the south-southeast. It is conceivable that *Rana areolata* could use certain treatment ponds, or the small pond adjacent to the west side of Bigler Road where Carbondale fire department members practice fire-fighting.

Jasper County: ten sites. **1)** Specimen collected in 1958 by Smith and Smith "4 miles south of Rose Hill" (INHS 8757); **2)** Specimen collected in 1958 by Smith and Smith "1.5 miles west of Newton" (INHS 8758); and **3a-3h)** eight sites on Prairie Ridge State Natural Area (Terry Esker, personal communication 2006).

I investigated sites in Jasper County on 29 September and 21 November 2006. I drove highway 33 westward from Newton to approximately 1.5 miles west of town. The topography is nearly level and the land is used for crop production. There is, however, a narrow band of low, grassy (fescue) and oldfield habitat adjacent to the railroad tracks that parallels the south side of highway 33. I observed numerous crawfish burrows in and adjacent to a shallow ditch at the junction of the tracks and 900E (38°59.567N, 88°12.419W). The ditch, however, is too shallow to hold water through the *Rana areolata* larval period. A small pond indicated on the topographic map just south of the junction of highway 33 and 890E no longer exists (38°59.575N, 88°12.679W; taken on road). If this was the site used by *Rana areolata* for breeding when Smith and Smith collected their specimen in 1958, then the species is likely extirpated at this locality today. I also observed a borrow pit pond on the south side of highway 33, just east of the

mentioned sites. However, this site appears deep and permanent, and is likely inhabited by predatory fish.

Both sides of highway 130 “4 miles south of Rose Hill” are relatively level and used for crop production. Based on what I saw, it seems unlikely that the frog Smith and Smith collected in 1958 was taken on highway 130. I also investigated the area “4 miles south of Rose Hill” along 1200E, which runs directly south from Rose Hill. Due to greater topographic relief, the habitat types here are more varied and include cropland, pastures, fescue fields, patches of deciduous forest associated with a stream system, homes, and large permanent ponds. The site observed that has the greatest potential to be inhabited by crawfish frogs is a pasture in a stream valley on the east side of 1200E, just south of 1300N (39°02.192N, 88°09.124W; taken on road). From the road, I could barely see a very small pond at the base of a wooded hillside. I could not discern whether or not this pond is suitable for *Rana areolata* reproduction. In general, this area appears to have low potential to be inhabited by *Rana areolata*.

With the help of Terry Esker, I located and examined eight sites on Prairie Ridge State Natural Area (PRSNA) where *Rana areolata* has been documented in the last five years (see also Marion County). Terry stressed that in addition to these confirmed sites, there are likely more undocumented *Rana areolata* breeding sites on PRSNA. Terry also informed me that wetlands having water control structures are de-watered every three years to eliminate fish. I have organized *Rana areolata* breeding sites on PRSNA by tract number and name.

Tract 1 (Donsbach): A series of three constructed wetlands that, per Terry Esker, are all used by *Rana areolata* for breeding (38°54.621N, 88°11.476W; taken on the berm/road between the northernmost and middle basins). The northern basin is relatively small, shallow and full of cattails. Most of the cattails are dead, having been treated with herbicide. The larger middle and southern basins are approximately 90% open water and ringed with cattails. The wetland complex is bordered by a cool-season grassland to the north and prairie restoration to the south. In 1996, Phillips et al (John Petzing, personal communication 2006) heard frog(s) calling northwest of the intersection of county roads 1000E and 400N (about 0.25 mile behind IDNR office). This suite of ponds is likely the source of the calls heard by Phillips et al.

Tract 2 (McCormick): A pair of adjacent (ca. 20 m apart) farm ponds separated by the dam of the upper pond (38°55.101N, 88°11.549W). Both basins hold water year-round. The northern pond is ca. 90% open water and is edged with *Polygonum*, grass, and a few cattails. The southern basin is 100% open water, but is immediately flanked by grasses. The ponds are flanked by oldfield vegetation, beyond which is actively-grazed (by cattle), restored cool- and warm-season grass pastures.

Tract 2 (McCormick): A relatively large constructed wetland nearly 90% covered by water primrose, sedges, grasses, rushes, and cattails (38°54.830N, 88°11.824W). The wetland is within restored grassland. To the south and west, on private property, is a CRP cool-season grassland dominated by fescue and brome. A field of corn lies beyond the grassland to the west.

Tract 8 (Robert Ridgway Grassland – Illinois Audubon Society): An approximately one-acre constructed wetland ≥75% vegetated (with cattails, rushes, and *Potamogeton* predominating; 38°54.470N, 88°10.579W). The basin has broad, well-vegetated shallow-water habitat. It is embedded within a restored tallgrass prairie.

Tract 16 (Mark): A small, muddy-water pond having grasses, rushes and *Polygonum* on the edge (38°56.531N, 88°11.244W). This pond is within a high-mowed, cool-season grassland dominated by brome grass. Across the nearby road, to the west, is a field of corn on private property.

Tract 17 (Walters): A constructed wetland lined with cattails, *Panicum*, and rushes around the perimeter (38°56.037N, 88°11.488W). Water primrose extends out into the open water beyond the cattail-dominated edge. The wetland is surrounded by restored prairie dominated by little bluestem.

Tract 23 (Fuson): A relatively large constructed wetland about 50% open-water and 50% vegetated with water smartweed, rushes, grasses, sedges, and cattails (38°55.535N, 88°15.240W). This wetland is surrounded by restored prairie grassland dominated by *Solidago*.

Tract 24 (Ameren CIPS): An old farm pond with approximately 80% coverage of smartweed and graminoids (38°56.814N, 88°14.888W). The pond is within a very weedy (principally horseweed), first-year prairie restoration near a forested drain.

Jefferson County: five sites. **1)** Two specimens collected in “Opdyke” by Smith in 1958 (INHS 8759-8760); **2)** multiple specimens observed by Keiser in 1959 and 1960 on his thesis study area in NW Jefferson County (Keiser, personal communication 2006); and **3a-3c)** multiple specimens observed by Keiser in the late 1950s and early 1960s at three sites in and around Mount Vernon (Keiser, personal communication 2006) including, perhaps, multiple specimens collected on the “Flota property, Mount Vernon” by Keiser in 1961 (LSU 69015, 69017-69019).

On 21 September 2006, I looked at former Superior Oil Company land, in the northwest part of the county, where Edmund Keiser conducted his thesis research in 1959 and 1960. Much of the land (to the north and west of Superior Lake) is now owned by the Jones family. I was given a tour of the property (approximately 600 acres) by Rick Jones. The topography is rolling to steep and

much of the land is forested with mature oak-hickory forest. In addition to forest, the land is used for cattle pasture and hay production. Some former cropland is now enrolled in CRP. In general, the landscape is unlike that typically inhabited by *Rana areolata*. However, there were intriguing low grasslands in the valley of the Big Muddy River. Suitable breeding sites, however, were lacking. I did see one pond (38°24.948N, 89°03.450W) that has low potential for crawfish frogs. The vegetation-less pond occurs within a narrow band of woods bordered on both sides by CRP grasslands.

On 22 September 2006, I investigated three areas in Mount Vernon where Edmund Keiser observed *Rana areolata* in the late 1950s and early 1960s. I assume that one of these sites is the "Flota property," as Dr. Keiser could not pinpoint the location of the Flota property on the map I sent him. I began on the southwest side of Mount Vernon where Keiser heard frogs calling "in a small pond in a field." I found an oldfield on the south side of Veteran's Memorial Boulevard (VMB), east of the un-named road to the baseball fields. The field, with its low, mesic areas and crawfish burrows, appears to provide good terrestrial habitat for *Rana areolata*. I located a temporary pond at the northeast corner of the field, on the south side of VMB (38°17.969N, 88°55.778W). The dry basin has a leaf-littered floor and is deeply shaded by red maple and pin oak. Although not an ideal *Rana areolata* breeding site, this pond warrants a visit during the *Rana areolata* breeding season. Just south of the pond, along a fence, is a low, grassy area where water obviously pools. If the hydrology of this spot is long enough, it would be a suitable crawfish frog breeding site. I also looked for a pond indicated on the topographic map south of VMB and just north of the baseball fields, in an extensive soybean field. I found a drainage ditch where the pond used to occur.

Another site where Keiser formally observed crawfish frogs is on the west side of the north half of town, near 20th Street and the Oakwood Cemetery. Both ponds indicated on the topographic map no longer exist. Except for a small woodlot between the cemetery and 20th Street, the area consists of housing, baseball fields, the cemetery, and an industrial complex (north of the railroad tracks), and a trash dump. The area is no longer suitable for *Rana areolata*.

Keiser's third crawfish frog area is on the east side of Mount Vernon, near the railroad tracks, north of Main Street. From Main Street I walked northward along the tracks examining habitat to the east and west. At 38°19.281N, 88°53.596W, I located two ponds in a low, mesic, mowed fescue field west of the tracks. There are large crawfish burrows in the field. One pond, orientated east-west, is a shallow basin and was nearly dry when examined. It is hydrologically connected by a small ditch to the larger ditch that parallels the railroad track. Although mostly leaf-littered, about ¼ of the basin is vegetated with grass. The pond is ringed with pin oak and silver maple. This pond appears to have potential as a *Rana areolata* breeding site. The other pond is permanent and appears unsuitable for *Rana areolata*.

I located a low, mesic spot in a soybean field east of the tracks vegetated with cocklebur, *Ludwigia*, and *Senescio* (38°19.292N, 88°53.490W). The hydrology of this little wetland is likely to be too short for *Rana areolata*. I believe it is more suitable for *Pseudacris triseriata*.

I located an ideal potential *Rana areolata* breeding site west of the railroad tracks (38°19.424N, 88°53.568W)! The canopy-free, shallow, nearly dry pond is ≥ 95% vegetated with grass and smartweed (with lesser amounts of cocklebur, sedge, rush, and buttonbush). The pond occurs within a recently-mowed fescue-goldenrod oldfield having copses of small trees/shrubs. This site definitely warrants a visit during the crawfish frog breeding season.

I examined the tiny hamlet of “Opdyke,” where a specimen was collected in 1958. The tiny town is surrounded by extensive, well-ditched soybean fields. I found some pasture east of town, behind a cemetery, but there was no breeding habitat. The only ponds I found in the vicinity of Opdyke were permanent and – presumably – inhabited by predatory fishes. *Rana areolata* is likely extirpated from Opdyke.

Johnson County: two sites. **1a)** Individuals observed in “Belknap” in early 1960s by Hutchison (Klimstra and Hutchison 1965); **1b)** one specimen collected in 2000 by Palis on “Belknap Road, 0.85 mile north of Belknap” (SIU 6599); **1c)** adults heard calling and metamorphs captured in 2002 and 2004 at two wetlands on Grassy Slough Preserve (GSP), near Belknap (personal observation); and **2)** one adult observed on highway 146, 0.75 mile west of Cache River in 2006 (personal observation).

I examined the two breeding sites on GSP on 23 October 2006. Wetland 1 (37°19.510N, 88°55.215W) is an approximately 43-acre, permanent-water Wetland Reserve Program (WRP) wetland constructed in spring 2000. The surrounding uplands have been planted to oak trees, but are presently dominated by early successional vegetation. Wetland 4 (37°19.467N, 88°55.640W) is an approximately 19.5-acre, permanent-water WRP wetland constructed in fall 1999. It is surrounded on three sides by an oldfield that has been planted with oak trees; the fourth side borders the Cache River levee. Both wetlands are vegetated at the perimeter by *Andropogon*, *Bidens*, *Eupatorium*, *Carex*, and *Juncus*. The community of Belknap and the location of the frog observed on Belknap Road are within 0.6 mile of Wetland 4. Therefore, I consider them part of the GSP *Rana areolata* population.

The area where I observed a frog on highway 146, 0.75 mile west of the Cache River (37°25.719N, 89°00.371W; taken on road), is a mix of cropland and fescue fields. There are several large, permanent, deep ponds on both sides of the highway. I assume these ponds contain predatory fish. With the permission of the landowner, Mrs. Ragsdale, I examined the relatively small, permanent pond

about 50 yards north of the highway and 50 yards west of her house on 12 March 2006. The frog on the road was in front of Mrs. Ragsdale house (6300 highway 146). Mrs. Ragsdale is not familiar with the call of *Rana areolata*, but she did say that *Rana sphenoccephala* used the pond for breeding. It is a typical farm pond, with turbid water and graminaceous vegetation limited to the perimeter. I walked around the pond and observed *Rana sphenoccephala* egg masses and adults; I also heard several males call. This site certainly warrants a visit on a night when *Rana areolata* are calling to pinpoint the location of the breeding site.

Lawrence County: one site. One specimen collected in “Lawrenceville” by Smith and Clark in 1956 (INHS 8097). I searched the area on 27 September 2006. Although the frog collected in 1956 may have actually been taken within the city limits of Lawrenceville, I elected to search outside the city due to an obvious lack of suitable habitat in town. I concentrated my search west and south of town, an area having the greatest potential to have *Rana areolata* habitat. Like elsewhere in southern Illinois, most level land outside of Lawrenceville is dedicated to crop production. I did find a permanent pond in a low fescue field near a stream (38°43.019N, 87°44.442W; taken on the road), but it likely contains fish. South of town I found an abandoned petroleum tank farm, reminiscent of the Patoka Tank Farm in Marion County where *Rana areolata* occurs. The area is topographically low, and has grown up in herbaceous oldfield vegetation. Most of the petroleum tanks are now gone, but the soil berms that once surrounded them still remain. If these berms hold water, they may provide suitable breeding habitat for *Rana areolata*.

Madison County: one site. Frog(s) observed in “Troy” by Smith (1953). I entered Troy from the east on highway 162 on 25 September 2006. Troy appears to be undergoing a construction boom as new residential areas are under development on the east and north (off Staunton Road) edges of town. The only undeveloped or unfarmed area I could find in Troy was on the northwest side of town. Here, on the west side of Riggins Road and the north side of a small creek, I found a small fescue field and riparian woods adjacent to a corn field (more residential housing south of the creek). According to the topographic map, a small pond occurs about 0.1 mile west of Riggins Road, north of the stream. However, the land was posted “no trespassing” so I was unable to examine the pond. I took a gps point at the fenced field on the west side of the road (38°44.533N, 89°53.678W). Whether this site actually warrants a return visit during the crawfish frog breeding season is unknown.

Massac County: four sites. **1)** Frogs heard calling “southeast of manager’s residence, Mermet Lake Conservation Area”, from 1965-1968 (John Schwegman, personal communication 2006); **2)** one specimen collected in 1995 by Redmer and Cook “1 kilometer east of Unionville on Unionville-Liberty Road (SIU 5506); **3)** frogs heard calling east-northeast of Unionville (37°08.02N, 88°31.22W) in 2006 (Ronald Brandon, personal communication 2006); **4)** frogs heard calling east-northeast of Unionville (37°07.90N, 88°29.97W) in 2006

(Ronald Brandon, personal communication 2006). I examined these sites on 23 October 2006.

The area southeast of the manager's residence on Mermet Lake Conservation Area consists of the small community of Mermet, a mesic oak flatwoods (east of highway 45) and extensive cropland (also east of highway 45). I saw no wetlands in the flatwoods except for a deep, permanent body of water adjacent to the north side of the road that trends eastward from town. It is possible that a low-lying area occurs within the flatwoods and is used as a breeding site by *Rana areolata*. However, I was unable to detect such an area from the road. I also looked at three wetlands on park property, west-northwest of the manager's residence. There are two, relatively new constructed-wetlands on the north side of the road that trends westward from the community of Mermet. One is adjacent, but not connected, to Tucker Ditch (37°16.612N, 88°51.784W). Approximately 85% of the surface is covered by water primrose. The other wetland, which is smaller, is 0.1-0.2 mile to the east (37°16.612N, 88°51.784W). This wetland is thickly vegetated with *Carex*, but also supports a variety of other herbaceous and woody wetland plant species. Both wetlands border a field planted to small grain (upland game hunting area) and are near oak flatwoods to the north and south. Assuming these wetlands are free of large, predatory fish (they are inhabited by *Gambusia affinis*), they appear to be ideal breeding sites for *Rana areolata*. The third wetland on park property near the manager's residence is a deeply-shaded pond on the edge of an oak flatwoods (37°16.519N, 88°51.330W). Based on movement in the water, it appears to be inhabited by large fish and is unlikely to be suitable for *Rana areolata*. I also looked at two small ponds off park property, east of the constructed wetlands. One is a very small basin, dry when examined, north of an abandoned church immediately east of the smaller constructed wetland. This site shows potential as a *Rana areolata* breeding site and should be visited during the *Rana areolata* breeding season. There is another small pond, encircled by trees, within a soybean field on the north side of Mermet (37°16.651N, 88°51.080W). It, too, was dry when examined. Due to a lack of herbaceous vegetation, it has limited potential as a *Rana areolata* breeding site. Nonetheless, it also warrants a visit during the *Rana areolata* breeding season.

The area "1 kilometer east of Unionville on Unionville-Liberty Road" is a mix of near-road homes/yards, hayfields, croplands, oldfields, and at least two small horse pastures on slightly rolling topography. I observed a potential *Rana areolata* breeding site (37°07.347N, 88°32.390W; taken on road) approximately 50 yards north of Unionville-Liberty Road, 0.45 mile east of the crossroad in Unionville. It is a very small pond straddling a fence of the east side of a horse pasture. This site warrants a visit during the *Rana areolata* breeding season.

The area east-northeast of Unionville (37°08.02N, 88°31.22W) consists of extensive oldfield habitat north of the road (downslope from the road and bordering a narrowly-wooded intermittent stream) and a house/barn complex

adjacent to a field of corn south of the road. An extensive cattle pasture occurs immediately west of the cornfield. Several ponds are indicated on the topographic map as occurring south of the road. However, because the land slopes upward from the road, I was unable to view these ponds. As a result, I could not assess their suitability as *Rana aeolata* breeding sites. One or more of these ponds may be the site from which frogs were heard calling.

The other location east-northeast of Unionville (37°07.90N, 88°29.97W) consists of a fescue/broomsedge hayfield north of the road and an extensive soybean south of the road. Approximately 50 yards north of the road at 37°07.918N and 88°29.880W (taken on road), is a pond at the base of a hill. This may be the site from which frogs were heard calling. The ditch adjacent to the north side of the road also shows some promise as a potential *Rana areolata* breeding site. That it holds water for a period of time is evident by the low-growing (repeatedly mowed) buttonbush and willows, as well as by the presence of *Carex* and *Echinochloa*.

Marion County: nine sites. **1)** Specimens collected in 1956 by Smith and Clark “7 miles north of Salem” (INHS 8094-8096); **2)** numerous frogs heard calling and observed in 2004 at the Patoka Tank Farm, south of Vernon (Richard Day, personal communication 2006); **3)** frogs heard calling in a CRP wetland southeast of Alma in 2006 (Richard Day, personal communication 2006); and **4a-4f)** frogs heard at six sites on Prairie Ridge State Natural Area (PRSNA) in the last five years (Terry Esker, personal communication 2006). I examined these sites on 26 and 29 September 2006.

At “7 miles north of Salem,” this site would be in the vicinity of the town of Alma, near I-57. The vast majority of the land near Alma is level and is used for crop production. However, just west of Alma, on the south side of 2nd Street, is an apple and peach orchard. Here, I found a relatively small, shallow farm pond on the north side of 2nd Street, 0.6 mile east of I-57 (38°42.202N, 88°55.123W). The pond is flanked by a small field of fescue, which then yields to cropland to the north and west. The pond, if fishless, may be suitable for *Rana areolata*. I continued west of I-57 on Oak Grove Road (1700N), but did not find anything else with as much potential as the site near the orchard.

The Patoka Tank Farm is adjacent to the east side of highway 51, 0.5 mile south of Vernon and 1.0 mile north of the North Fork of the Kaskaskia River. The site is a storage facility for petroleum products. The large storage tanks are secured behind chain-link fencing and are encircled by earthen berms. According to Richard Day, water pools within the berms providing *Rana areolata* breeding habitat. The level ground around the tanks is maintained in low grass (i.e., lawn). A small, willow-lined pond occurs in an unmowed grassland north of Dickey Road, 0.4 mile east of highway 51. There is oldfield habitat and cattle pasture south of Dickey Road, 0.6 and 0.9 mile east of highway 51, respectively. Elsewhere, the land supports row-crops.

The CRP wetland, southeast of Alma, is owned by nature photographers, Richard and Susan Day. The wetland (38°42.447N, 88°54.161W) is within a small field of early-successional herbaceous vegetation which borders a deciduous forest to the south. Elsewhere, the relatively level land is dedicated to row-crop agriculture. The north end of the wetland, dry when I visited, supports a rank growth of graminaceous vegetation. This portion of the wetland likely provides ideal breeding and larval habitat for *Rana areolata* when inundated.

The following sites are on PRSNA where *Rana areolata* has been documented in the last five years (see also Jasper County). Breeding sites are organized by tract number and name.

Tract 4 (Loy 100): A large (≥ 2 acres) and very shallow basin on the north side of 2000N (38°46.431N, 88°47.956W). When visited on 29 September, the site was dry and overwhelmingly dominated by cocklebur (but also contained grasses and sedges). It is bordered by weedy oldfield to the north, west and south (south of road) and a soybean field to the east (private land).

Tract 6 (Butler): An open-water pond with a large earthen berm on one side, about 50 yards north of 1700N, 0.4 mile east of 1700E (38°43.381N, 88°49.157W). The pond is ringed with cattails and *Polygonum*, and has duckweed over about half its surface. The surrounding rolling terrain is carpeted with high-mowed, cool-season grasses (particularly brome). South of the road, on private property, is an extensive soybean field.

Tract 9 (Survey): A shallow, irregularly-shaped basin on the north side of 1800N, 0.2 mile east of 1600E (38°44.227N, 88°50.500W; taken at fence on property edge). The basin was dry when examined on 29 September, and full of *Polygonum*. It occurs within a small fescue grassland dotted with numerous tree stumps. Old field habitat (prairie restoration) occurs to the north, east, and west. A house/yard and extensive soybean field occurs south of the road on private property.

Tract 9 (Survey): A shallow-basin, dry pond that is full of *Echinochloa* in the center and *Polygonum* around the perimeter (38°44.450N, 88°50.625W). The pond is just east of a large, brown, metal barn and downslope (southwest) of what may be another pond. It occurs within a high-mowed cool-season grassland (fescue and brome).

Tract 10 (Bartels): A large constructed wetland (ca. 2 acres) 0.2 mile south of 1900N, just west of railroad tracks (38°44.910N, 88°51.342W). The shallow basin was dry when examined on 29 September and is vegetated principally with cocklebur, as well as grasses and *Scirpus*. Muskrat burrows in the dam may have drained this basin. The basin is embedded with a restored tallgrass prairie. A field of soybeans occurs to the east, across the tracks.

Tract 10 (Bartels): An approximately 4-acre constructed wetland 0.1 mile south of 1900N, 0.3 mile west of the railroad tracks (38°45.000N, 88°51.606W). When examined on 29 September, water covered about 75% of the basin.

Approximately 2/3 of the basin is vegetated with cocklebur, *Polygonum*, cattails, grasses, and sedges. It is surrounded by restored tallgrass prairie (Illinois Audubon Society). There is oldfield habitat to the west and a soybean field north of 1900N.

Montgomery County: one site. One specimen collected in 1942 by Gloyd et al. "7 miles north of Litchfield" (CA 10915). Prior to attempting to locate this site, I talked with Richard Egren, one of the collectors of the specimen. Mr. Egren accompanied Gloyd on a field trip during spring vacation from high school. They collected frogs at various locations and Egren did not recall the capture of the crawfish frog.

I examined the area on 26 September 2006. I began by searching for potential habitat along highway 108 west of I-55. I found two small ponds near the road, both in cattle pastures. The first pond is north of highway 108 (39°16.745N, 89°39.684W; taken on the road) and is just west of Shop Creek. The creek is flanked by low pasture. The second pond is south of highway 108 (39°16.708N, 89°39.317W; taken on the road). If these ponds are free of predatory fishes, they may be suitable for *Rana areolata*. I located another area of interest along the frontage road that parallels the east side of I-55, 2.0 miles south of highway 108. Here, an extensive pasture flanks 3-Mile Branch, a small stream. A farm pond is indicated on the topographic map in the pasture north of the stream. I took a GPS point at the junction of the frontage road and 17th Avenue to pinpoint the general area (39°14.921N, 89°38.444W).

Perry County: three sites. **1)** Specimens collected in 1957 by Rossman "1 mile south of Tamaroa" (LSU 6571, 7117); **2)** species observed by Myers in early 1960s in the "centrally-located eroded plot" of Pyatts Stripland Research Area (Myers and Klimstra 1963); **3)** frogs heard calling in the vicinity of railroad tracks and Gas Plant Road on the south side of Du Quoin in the 1990s by Steve Karsen (personal communication 2006).

I explored the area on 21 September 2006. Dr. Rossman (personal communication 2006) stated that the *Rana areolata* he collected south of Tamaroa were in flooded depressions that he had to cross a cornfield to reach. I examined some low depressions in a cornfield east of highway 51, north of Pigeon Road, and west of Starling Road (which parallels north-south trending railroad tracks). The largest one, just west of Starling Road, and 0.1 mile north of Pigeon Road (38°06.836N, 89°14.074W), appears suitable for the chorus frog (*Pseudacris triseriata*) but questionable for *Rana areolata*. It is highly unlikely that the hydrology of any of the small, shallow depressions I examined would be long enough to permit development and metamorphosis of *Rana areolata* larvae.

A shallow ditch drains the cornfield, carrying water to the south. This ditch may not have been present when Rossman visited the area in the 1950s. There is a well-vegetated drainage ditch between the RR tracks and Starling Road, which likely holds water longer than the field depressions. The ditch might provide suitable *Rana areolata* breeding habitat. I also looked for a small pond indicated on the topographic map just west of highway 51, near the south side of an east-west trending RR track. This pond no longer exists, having been converted to a ditch. It is now a grassy swale in a cropland. There are two small pools of water at each end of a culvert opening beneath a road that parallels the south side of the RR tracks. Although I saw cricket frogs (*Acris crepitans*) and southern leopard frogs (*Rana sphenoccephala*), I don't believe these small pools are suitable for *Rana areolata*. It is unlikely that *Rana areolata* still occurs at this historic location.

With the aid of an aerial photograph and park personnel, I located Myers and Klimstra's (1963) "centrally-located eroded plot" within what is now Pyramid State Park. Although Myers and Klimstra (1963) stated that this portion of their study area was not mined, park personnel stated that it had been mined and then reclaimed. The area, now known as the "lost 40" is also mapped as a reclaimed mine on the Pinckneyville topographic map. The "lost 40" is principally flat grassland (nearly monotypic; appears to be a type of *Digitaria*) interspersed with narrowly wooded drainage ditches. I did locate several low areas where water obviously pools, as well as a very small woodland pond and portions of ditches that, based on vegetation, appear to hold water for extended periods of time. These potential amphibian breeding sites are scattered within the area at the following locations: 38°00.802N, 89°25.367W; 38°00.692N, 89°25.420W; 38°00.80N, 89°25.592W; and 38°00.885N, 89°25.558W. None of these sites appears ideal for *Rana areolata*. Sites having herbaceous vegetation appear to hold water for short durations, whereas those that appear to have longer hydrologies have little to no herbaceous vegetation. Overall, the area has limited potential to support a *Rana areolata* population.

The land near the juncture of Gas Plant Road and the RR tracks is low and is likely subject to flooding during periods of wet weather. Much of the area east of the tracks, south of Gas Plant Road, is carpeted with mowed lawn associated with scattered homes. In addition, a narrow band of woodland parallels the tracks approximately 50 m south of the road. A similar narrow band of woodland parallels the east side of the tracks north of Gas Plant Road. Immediately east of this band of trees is a complex of mowed grass and commercial development. Extensive cropland occurs west of the tracks, both south and north of Gas Plant Road. A narrow band of unkempt ground lies between the tracks and the cropland. South of Gas Plant Road this "wild" area is graminaceous, whereas north of the road it is principally wooded. The only potential amphibian breeding site observed on 21 September 2006 was a small pond in the cropland NW of the junction of Gas Plant Road and the RR tracks. The pond was choked with *Phragmites* and empties into a weed-lined ditch that drains southwest from pond

through the cropfield. I suspect the ditch has shortened the pond's hydrology. The pond appears to be an unlikely breeding site for *Rana areolata*. I revisited the area on 16 January 2007. Because autumn 2006 was unusually wet, water was pooled in many low-lying areas. I observed two shallow pools that had formed since my previous visit. One is about 50 m south of Gas Plant Road, east of the RR tracks, at the junction of mowed grass and the wooded area. The second pool is in the unkempt area west of the RR tracks and north of Gas Plant Road (37°59.704N, 89°14.368W). The extent of this elongate pool suggests that it has a relatively long hydroperiod, and that it is likely the *Rana areolata* breeding site from which frogs were heard calling in the early 1990s. Although much of it is wooded (red maple, ash, willow, pin oak), the south end is open and graminaceous (principally foxtail, broomsedge, *Echinochloa*, but also cocklebur and algae). This site should be visited under appropriate conditions during the *Rana areolata* breeding season.

Pike County: one site. Specimen collected in 1960 "1.5 miles northeast of Summer Hill" by Smith and McGintie (INHS 9230). I looked for this site on 25 September 2006. Based on the topographic map, I expected to find several ponds amid the rolling topography off of 1100N, east of highway 54 (northeast of Summer Hill). The first two ponds I wished to examine, just south of the home of Nora Renoud, no longer exist. Mrs. Renoud said they were destroyed several years ago. The remnant of the dam of one pond still exists (in a cattle pasture). This pond may have been a suitable *Rana areolata* breeding site. Mrs. Renoud gave me permission to examine two ponds east of her house, on land owned by her son. She said the pond in the soybean field had nearly filled in/dried, so her son dug it out this spring. This pond, on the south side of 1100N is now full of clear water (39°33.671N, 90°54.194W). It is an ideal frog pond. It has extensive shallow-water habitat, well-vegetated with *Echinochloa* and *Polygonum*. I saw numerous adult *Rana sphenoccephala*, as well as *Acris crepitans* and *Rana catesbeiana*. The north, west, and east sides of the pond are separated from the soybean field by a 3-yard-wide strip of grass. To the east, below the dam, is a weedy, unkempt area about one acre in extent. Just beyond that is a partially wooded cattle pasture. There is a pond in the cattle pasture. This pond supports a stand of lotus as well as some emergent grasses. Much of the steep bank is devoid of vegetation due to the activities of the cattle. This pond appears permanent and may contain predatory fish. These two ponds certainly warrant a visit during the *Rana areolata* breeding season; especially the one in the soybean field.

Pope County: three sites. 1) Specimen collected in 1964 by Robinson at the "Dixon Springs Experimental Station" ("Cullum pond, East Lauderdale Pond;" UIMNH 5655); 2) frogs(s) heard calling from a "mudhole" in approximately 2003 by Dan Woolard on the property of Mike Dotson; and 3) frog observed on road in spring 2006 by Ron Brandon, just north of Round Pond (gps coordinates provided: 37°08.390N, 88°28.350W).

I visited sites in Pope County on 23 October 2006 and 4 April 2007. At 37°08.389N, 88°28.351W -- where Ron Brandon saw a frog in 2006 -- the rolling land adjacent to both sides of the road is used for agriculture. To the north and east the ground is planted to corn, whereas to the south there is a fescue field and house. The only pond that was accessible was adjacent to the north side of the road, just east of the house. It is a well-shaded, permanent pond within a woodlot. Because it lacks herbaceous vegetation and probably contains predatory fish, this pond is not likely to be used by *Rana areolata* for breeding. Pinpointing a breeding site in this area will require a return visit during the crawfish frog breeding season.

On 4 April 2007, I examined ponds on the property of Mike Dotson and on the Dixon Springs Agriculture Center. Mike heard crawfish frogs calling in all three ponds on his property this spring, all of which are within 100 yards of his house. Pond one is the site where Dan Woolard first observed crawfish frogs. It is a small, shallow, cattle-watering pond in former cattle pasture (37°18.855N, 88°38.729W). Cattle were pastured here as recently as nine years ago. Mike informed me that this pond generally holds water for less than two weeks. It was full of turbid water during my visit, the result of heavy rains the previous day. It contains much graminaceous vegetation, providing ideal amphibian habitat. The pond is surrounded by fescue field which yields to cropland to the south and planted prairie grasses to the west and northwest. The second pond was constructed in summer 2006 (37°18.866N, 88°38.689W). It is surrounded by fescue field and yard associated with Mr. Dotson's house. Mike stocked fish into this pond recently (2007). The third pond, also in fescue field, has a leaking dam (37°18.916N, 88°38.643W). As a result of the leak, a relatively small amount of water pools in a horseshoe shape near the dam. Much of the pond basin supports a dense growth of blackberry and Japanese honeysuckle. According to Mike, the hydrology of this pond is short like pond one. Given the presence of predatory fish (catfish) in the permanent pond, and the shortened hydroperiod of the leaking ponds, none of these ponds provide ideal crawfish frog breeding habitat. It is likely that the crawfish frog population persists here due to usage of ponds that may be nearby. Extensive cattle pasture occurs east and north of Mike's property, beyond some woodland. There may be suitable breeding habitat in these pastures. There is also an extensive hayfield west of the road.

With the help of Mary Trovillion and Butch Hart, I was able to locate a pond on the Lauderdale tract and another on the Cullum tract of the Dixon Springs Agricultural Center (DSAC) on 4 April 2007. The potential *Rana areolata* breeding site on the Lauderdale tract is a sewage lagoon about 0.15 mile northeast of the DSAC main office building (37°26.175N, 88°39.946W). The small, steep-banked, sparsely vegetated pond is at the lower end of a fescue field and upslope of forest. It is used by a variety of amphibians including spotted salamanders (egg masses), tiger salamanders (larvae), cricket frogs (adults), bullfrogs (subadults), and southern leopard frogs (egg mass and adults). I located a second small sewage lagoon just southeast of a large pond about 0.5

mile south of the main office. I saw adult southern leopard frogs, as well as larval and adult American toads here (37°25.738N, 88°40.092W). The pond is downslope of a hog barn, within a fescue field, and upslope of forest. This pond is more eutrophic than the other sewage lagoon (much algae), and may not be as suitable for crawfish frog reproduction.

I then located a pond in the Cullum tract (37°26.415N, 88°37.896W). This large pond is surrounded by extensive cattle pasture, but cattle are prevented access to the pond by a barbed wire fence. Based on the mature forest of red maple, ash, and river birch surrounding the pond, it appears this pond has been separated from cattle for a long period of time. Despite the wooded banks, the pond is rather well vegetated with *Nuphar*, smartweed, "coontail," grass, algae, duckweed, and buttonbush. Based on the frequency of amphibian sightings (large ranid tadpoles, adult central newts, spotted salamander and southern leopard frog egg masses, and adult cricket frogs), I believe the pond is fishless. If so, it provides ideal *Rana areolata* breeding habitat.

Applegate and Zimbleman (1978) provided an annotated list of amphibians and reptiles they observed on DSAC from 1969 through 1976, which included *Rana areolata*. They described *Rana areolata* as "rare" on DSAC, but provided no specific locality information.

Pulaski County: one site. Specimens collected at "Ullin" by Thorpe in 1936 and 1937 (SIUC 1862, 1127-1133). I examined the Ullin area on 27 October 2006. I began by examining a large, flat plain bisected by Egyptian Trail Road, about one mile north of Ullin, and west of Highway 51. Much of the flat ground is used for row-crop agriculture, but there is also a large fescue field adjacent to a well-vegetated (with *Carex*) ditch (37°17.619N, 89°10.853W: taken at ditch/road junction). The ditch ultimately connects to Indian Camp Creek, which could provide a source for invasion by predatory fishes. However, the density of the vegetation may allow successful use of the ditch by amphibians, including *Rana areolata*. Just west of the fescue field the land rises to a wooded hillside. The Dongola topographic map indicates the presence of several ponds on the south and west slopes of the hill. These ponds, unfortunately, were inaccessible.

I then went east of Highway 51 on Egyptian Trail Road, passing through an extensive oldfield (enrolled in WRP according to signs present). I located two WRP wetlands on the south side of Butter Ridge Road, one 0.1 mile east of Egyptian Trail Road, the other 0.2 mile east. The westernmost wetland is smaller and appears suitable for *Rana areolata* (37°17.320N, 89°10.428W; taken on road). If *Rana areolata* persisted here while the land that is now enrolled in WRP was being used for crop production, then they may now use one or both of these WRP wetlands as breeding sites.

In Ullin itself, I observed a low area in a cropland that is holding water. The pool is north of Ullin Avenue, on the east side of the "Cache Valley Apartments," 0.45 mile east of Highway 51 (37°16.880N, 89°10.609W; taken on road).

I also observed ponded areas on the edge of Ullin, west of Highway 51. One is adjacent to Railroad Street, 0.1 mile north of Indian Camp Creek (37°16.763N, 89°11.217W; taken on road). The other is on the north side of Ullin Road adjacent to a former railroad grade on the west side of town (37°16.563N, 89°11.600W; taken on road). Due to the wooded, shaded nature of both ponds, neither site ideal for *Rana areolata*.

With the exception of Ullin itself, the hills about one mile north of town, and the swamps associated with the Cache River (which passes by the south side of town), all level ground in the area is used for row-crop agriculture. If *Rana areolata* still inhabit the area, they are likely associated with the hills to the north, the WRP ground to the northeast, or low areas within cropland as near the Cache Valley Apartments.

Richland County: five sites. **1)** Specimen collected in 1884 (USNM 13828) at "Sugar Creek Prairie, 10 miles from Olney" by Walker and Walker; **2a)** specimens collected at "Calhoun" in 1910 by LaRue (CAS 38951-38952) and in 1911 by LaRue (UMMZ 42448); **2b)** specimens collected "near Calhoun" by an unknown collector on an unknown date (UMMZ 44362-44366) and in 1913 by Champlain and Thompson (UMMZ 44463-44468); **3)** specimen collected by Ridgway in 1912 at "Olney" (USNM 49590); **4)** specimen collected in 1923 by Dean at "bird haven, near Olney" (UMMZ 58503); and **5)** specimen collected by Smith and Clark in 1956, "6 miles east of Clay City" (INHS 8100).

On 26 September 2006, I examined the area six miles east of Clay City. This distance from Clay City is essentially the west side of the small town of Noble. I began my search along 300E, south of highway 50, southwest of Noble. Two ponds indicated on the Noble topographic map, about 0.5 mile south of highway 50, no longer exist, having been converted to cropland. I did locate one farm pond on the west side of 300E, 0.9 mile south of highway 50 (38°40.368N, 88°14.530W; taken on road). The permanent-water pond is vegetated with water primrose and algae. It's at the north end of a mowed yard, and adjacent to a narrow band of oldfield habitat which yields to extensive cropland. If the pond is fishless, it may be suitable for *Rana areolata*. I then investigated some unkempt ground on the east side of 300E, between highway 250 to the south and RR tracks to the north (GPS point at junction of tracks and 300E = 38°41.603N, 88°14.512W). Here, prairie vegetation mixes with weedy herbaceous plants and invading trees (especially red maple). Further east is a cattle/horse pasture. I could not find the small pond indicated on the topographic map; it may best be located by following frog calls. There is also a ditch adjacent to the south side of the RR tracks on the east side of 300E. The hydrology of this ditch, however, is unknown. Given the presence of mesic grassland (unburned prairie/oldfield and

pasture), *Rana areolata* could still occur here, on the west side of Noble, assuming a suitable breeding site still exists.

On 27 September 2006, I examined the remainder of the Richland County sites. My first stop was the Olney Bird haven, which is on the north side of Olney. The Bird Haven is no more than a small, wooded (oak-hickory forest) picnic area on the east side of East Road, at the southwest shore of East Fork Lake. Beyond the forest, to the south, the rolling land is used for crop production and housing. There is no *Rana areolata* habitat at this location. East Fork Lake did not exist in 1923 when Dean made his collection (the lake was construction some time after 1970 per the 1972 Edwards and Richland counties soil survey). Perhaps suitable *Rana areolata* habitat was drowned by the construction of this impoundment.

I then examined the vicinity of Calhoun. Calhoun is a very small hamlet surrounded by a sea of cropland. According to the 1991 DeLorme Illinois Atlas, much of the land west, north, and east of Calhoun is the Richland County Public Hunting Area. The public hunting area no longer exists and the land is all privately owned. Like elsewhere, the former hunting area is now used for crop production. I concentrated my effort east of Calhoun because here, topographic relief provided the potential to find land used for something other than crop production, and because Thompson (1915) specifically stated that *Rana areolata* occurred "in considerable numbers in the region east of Calhoun."

Several ponds delineated on the topographic map that I wished to examine no longer exist (e.g., at 38°39.527N, 88°01.522W and 38°39.307N, 88°00.655W). They have been converted to ditches or grassy swales through cropland. One extant farm pond occurs east of 1600E, 0.1 mile south of 550N (38°39.191N, 88°00.207W; taken on road). This permanent-water pond is within a small fescue/broomsedge oldfield on the edge of an extensive crop field. The west end of the pond is shallow and well-vegetated with graminoids. If fishless, it could be suitable for *Rana areolata* reproduction.

Another area of interest occurs in the vicinity of 38°38.638N, 88°00.758W (500N at a stream crossing). Southeast of this point, in a cattle pasture, is a pond that according to the landowner's description sounds like a potential *Rana areolata* breeding site. Unfortunately, the landowner denied me permission to examine the pond. Nearby, another landowner, Dick Smith, did give me permission to examine two ponds on his property on the west side of 1600E, about 0.25 mile south of 500N. The first pond I examined (38°38.568N, 88°00.297W) is a turbid-water, permanent pond constructed on a wooded slope above a stream valley. This pond is unlikely to be used by *Rana areolata*. The second pond, however, just south of Mr. Smith's house, appears ideal for *Rana areolata* (38°38.431N, 88°00.228W). The pond, well-vegetated with cattails and smartweed, was dry when examined. It occurs within a small oldfield vegetated with purpletop, broomsedge, goldenrod, *Erigeron*, *Bidens*, and ironweed. According to Mr.

Smith, crawfish borrows are abundant in the adjoining mowed yard during the spring. Further south, on the east side of 1600E and north side of 400N is a private hunt club. Much of the area is an extensive oldfield. It could be good *Rana areolata* habitat if a suitable breeding site occurs on the property.

I then examined the vicinity of Parkersburg as this area corresponds to the 1884 collection of a frog from the "Sugar Creek Prairie, 10 miles from Olney." I found an intriguing small, shallow pond basin (dry when examined) north of 150N (Parkersburg Road), 0.9 mile east of the sharp bend in the road on the east side of Parkersburg (38°35.628N, 88°02.081W). The pond is vegetated throughout with cocklebur and a low-growing graminoid. It is on the edge of a riparian woods and downslope of a goldenrod-dominated oldfield. This pond may be suitable for *Rana areolata* reproduction.

After examining extensive cropland south and west of Parkersburg, I went north from Parkersburg on Main Street (1275E). I passed through the flat valley of Sugar Creek, which was being used as cattle pasture and hay production. Unfortunately, there appeared to be no wetlands or ponds in the valley. Continuing north on 1275E, I came to 300N. There is a pair of ponds south of 300N, 0.1 mile west of 1275E (38°36.781N, 88°03.822W). The eastern pond is large, deep and unlikely to be suitable for *Rana areolata* reproduction. The western pond, however, is shallow and is vegetated with *Echinochloa*, cocklebur, and buttonbush on the edge. I saw adult *Acris crepitans* and *Rana sphenoccephala*, but no fish. The pond is immediately bordered by a 5-m wide band of oldfield vegetation, beyond which to the south, west, and north is an extensive soybean field. There is a grassy area below and east of the dam of the larger pond. The western pond may be suitable for *Rana areolata*.

Saline County: three sites. 1) Specimen collected by Ozment in 1961 at "Stonefort, ploughed up in a field" (AU 4540); 2) specimens collected by Petzing et al. in 2002 "north of new route 13, 0.5 mile east of Williamson County line" (INHS 17925, 19039-19045); and 3) frogs heard calling by Jody Shimp near his home, west of Harrisburg, in 2006 (Shimp, Personal communication 2006).

I examined these areas on 4 and 5 April 2007, and 3 June 2007. I began (4 April) at the small town of Stonefort. On the advice of George Folkerts of Auburn University, who was a classmate of Jim Ozment at SIU, I located Jim's mother, Winnie. Mrs. Ozment, now 94 years of age, did not specifically recall the crawfish frog her son had collected. Nor could she direct me to the old family farm where the frog was ploughed up. As it turns out, the Ozments owned several small rural tracts scattered over several counties. Because Mrs. Ozment never visited any of the sites owned by her late husband, she could not direct me to them. The area adjacent to the southeast side of Stonefort is flat and devoted to row crop agriculture. The area is well drained by ditches, and perhaps drainage tile, and several of the ponds indicated on the topographic map no longer exist. I examined an area northwest and upslope of town. Here I found a

pair of ponds on either side of the road, in Williamson County, near the Stonefort water tower. One pond is on the west side of the road in a horse pasture (37°37.363N, 88°42.778W; taken adjacent to fence close to pond). The pond has very little herbaceous vegetation and has a few willows on its edge. If this small, turbid-water pond is fish-free, then it could be suitable for *Rana areolata*. A larger pond occurs east of the road (37°37.365N, 88°42.769W; taken adjacent to fence near the pond). This pond, which also has very little herbaceous vegetation, is within a fescue-broomsedge field. Movement in the water suggests the presence of fish. Although these sites are in Williamson County, they provide potentially suitable *Rana areolata* habitat near Stonefort.

I looked for Jody Shimp's site on the west side of Harrisburg on 5 April 2007. Jody can hear crawfish frogs calling from his nearby home (including March 2007). The map sent to me by Shimp points to Barnett Street, 1.5 miles west of highway 45 (or 0.25 mile east of Liberty Street). At this point there are houses to the north and a relatively large fescue-broomsedge field to the south (37°43.235N, 88°34.022W; taken on the road). I walked into the field, back to an old strip-mined area, but did not find a pond. I also observed a horse pasture to the southwest, but no pond. I did observe a small pond (sewage lagoon?) about 50 yards north of Barnett, about 30 yards west of Gibbons Lane (behind a double wide manufactured home; 37°43.248N, 88°34.095W; taken on Gibbons Lane). This pond, at the low end of a mowed lawn, is full of graminoids and forbs. It is a potential *Rana areolata* breeding site.

I examined the site north of new highway 13, 0.5 mile east of the Williamson County/Saline County line on 3 June 2007 (37°44.143N, 88°41.748W). The site is within a fenced wetland mitigation area. The wetland where John Petzing observed crawfish frogs is a human-made marsh within a mesic woods. The marsh has nearly 100% herbaceous coverage of *Typha latifolia*, *Polygonum*, *Juncus*, *Carex*, *Iris*, *Pontedaria cordata*, *Rumex verticillatus*, and *Phragmites*. The marsh has also been planted with bald cypress and buttonbush. This marsh was nearly dry when I visited, and *Rana* tadpoles were concentrated in two small, very shallow pools. The marsh is immediately flanked by young trees including willow, red maple, ash, river birch, and *Cornus*. The mesic forest beyond the marsh edge is dominated by ash, but also includes red maple, pin oak, river birch, sycamore, and sweetgum. The forested wetland mitigation area is bordered to the west by cattle pasture and to the north and east by cropland.

Union County: two sites. 1) Specimen collected in 1997 by Redmer "approximately 4 miles northeast of Dongola, in front of Christian Church" (SIUC 5542); 2) one adult observed on Cypress Creek Road, 0.2 mile west of Johnson Dairy Road in 2001 (personal observation).

I examined these areas on 3 November 2006. Christian Church is located on the west side of Christian Chapel Road, 0.9 mile north of Cypress Road (37°23.340N, 89°07.821W; taken on road). The church is surrounded by mowed

lawn, which includes a low spot south of the church where water pools temporarily during rainy periods (personal observation). The hydroperiod of this pool, however, is too short to support the larval period of *Rana areolata*. Immediately west and downslope of the church is a small cropland that yields to deciduous woodland associated with a drain. There is a cemetery southwest of the church. I drove the perimeter of the cemetery and examined adjacent habitat. Downslope from the northeast corner of the cemetery is a deep sinkhole with exposed, cracked limestone at the bottom. This sink probably does not hold water. Southwest and south of the cemetery is an extensive, rolling cattle pasture. Two sinks are visible in the pasture, but their hydrology is unknown. In addition, the Anna topographic map shows a farm pond near the southwest corner of the cemetery and another in the pasture to the south. The pond to the southwest no longer exists. I could not see the pond in the pasture due to the topography. An extensive, rolling hayfield (Johnson grass, broomsedge, and fescue) occurs east of Christian Chapel Road. Immediately across the road from the church is a deep, wooded sinkhole. The hydrology of the sink is unknown. Additional sinks, woodlands, and cattle pastures occur to the east, along Burns Road. This intriguing area warrants a visit under appropriate conditions during the *Rana areolata* breeding season.

The sighting of the frog on Cypress Road occurred at 37°22.51N, 89°05.87W. To the south, the land slopes downward away from the road to a fescue/broomsedge hayfield. The land continues to slope downward and flattens near the bank of a channelized stream, Adds Branch. Additional fescue/broomsedge hayfield occurs north of Cypress Road. The land is flat adjacent to the road, but then slopes upward into patches of deciduous forest. According to the topographic map, a small pond is upslope, about 0.2 mile north of Cypress Road. However, I was unable to gain access to assess the pond. I was able to view a pond just west of Moscow Road, 0.2 mile north of Cypress Road (37°22.705N, 89°05.988W). The pond was nearly dry; however, judging by the height of the dam, this was probably atypical. The pond is likely fishless and may be suitable for *Rana areolata* reproduction. The pond is at the edge of a hill in cropland that slopes downward to Adds Branch. There is cattle pasture east of the road. Pinpointing the *Rana areolata* breeding site at this location will require a visit under appropriate conditions during the frog's breeding season.

Washington County: one site. One specimen collected in 1958 by Smith "1.5 mile southwest of Nashville" (INHS 8821). I searched the area on 21 September 2006. The rolling country is overwhelmingly utilized for row-crop production and is well drained by several ditches. I did find a small, dry pond on the east side of Harrison Road, 0.2 mile south of Grand Road (38°19.751N, 89°23.94W). The pond, vegetated with cattails and cocklebur, lies between a soybean field and a small stream. Should *Rana areolata* find the intensively managed cropland (or the mowed yards just W of Harrison Road) habitable, this pond may be suitable as a breeding site.

White County: one site. **1)** Specimen collected by Smith at “Carmi” in 1958 (INHS 8763). I examined the vicinity of Carmi on 5 April 2007. The south and southeast side of town is bordered by new housing development and flat, extensive croplands. The north side is bordered by relatively steep topography associated with Big Hill Branch. Therefore, I concentrated my search for habitat on the west side of Carmi. I found a pair of potentially suitable *Rana areolata* breeding sites on the north and south side of Stewart Street (38°05.425N, 88°11.101W; taken on road). The smaller pond, north of the road, is within a horse pasture. The larger pond, to the south, is within a fescue field. Both ponds are well vegetated with herbaceous vegetation. The grasslands appear relatively mesic. I did not locate any other potentially suitable habitat, although that may have been due to housing adjacent to the roads I traveled, preventing visibility of grasslands beyond.

Williamson County: 21 records. **1a)** Specimens collected at “Herrin” by Smith in 1937 (UIMNH 217-224), 1939 (UIMNH 4951-4961), 1940 (UIMNH 4379), and an unrecorded date (SIUC 2604), as well as by Henderson in 1938 (SIUC 2668); **1b)** specimens collected at “Sycamore Pond, Herrin” by Smith in 1939 (INHS 132-133); **2a)** specimens collected by Brandon and Altig in 1964 (SIUC 3172-3175) near the “sailboat basin” on the west side of Crab Orchard Lake; **2b)** specimen collected by Brandon in 1968 (UMMZ 151752; labeled “NTD in field notes on file”; likely corresponds to sailboat basin site [Ron Brandon, personal communication 2006]); **3)** specimen collected by Altig in 1965 “on road along west side of Crab Orchard Lake;” **4)** specimen collected in 1969 by Nesbit on “Buchanan Street, Marion;” **5)** frogs heard calling south of Crab Orchard NWR in late 1970s, on property of Tim Moss (Dan Woolard, personal communication 2006); **6)** frogs observed on Spillway Road at and from 0.1–1.1 mile S of Broken Handle Lane by Palis in late 1970s, 1997 and 2002 (SIUC 7158, 7162, and 7211), also on this stretch of road by Palis and Lechowiz in 2000 (SIUC 7185), Redmer in 1992 (SIUC 4154 and 4389), and Wilson and Fusek in 1999 (SIUC 7107); **7)** frogs observed on Dogwood Road by Redmer in 1992 (SIUC 4390-91); **8a)** frogs observed by Redmer in ponds in/around Lakewood Subdivision off Spillway Road (Redmer, personal communication) in 1991 (SIUC 4547), 1994 (SIUC 4732), and 1996 (INHS 12850-851), and by Redmer and Humbert in 1992 (SIUC 6847); **8b)** approximately 2 dozen frogs observed by Palis in 1996 at breeding site < 0.1 mile W of Spillway Road, about 0.1 mile S of Broken handle Lane; **9)** Redmer collected a specimen in 1991 (SIUC 4547) in the south center of Section 29 (vicinity of Lakewood Subdivision off Spillway Road); **10)** specimen collected by Blanford and Burke in 1994 (SIUC 4646) “0.25 mile west of Spillway Road on 151;” **11)** specimen collected in 1992 by Lampley (SIUC 4388), “2 miles north of Johnston City High School;” **12)** frog observed on Cobb Hill Road, east of Lake of Egypt, by Bob Lacy (personal communication 2006) in 2006. The following sites are from Fairbairn and Lips (2004). In 2004, Fairbairn and Lips listened for calling frogs at/near Redmer sites in the vicinity of the Lakewood subdivision off Spillway Road, as well as at sites near Wolf Creek Road on Crab Orchard National Wildlife Refuge (CONWR). Several of these sites correspond

to sites previously listed above. **location 1 (8a)**: frogs calling from unknown location near junction of Broken Handle Lane and Propeller Point east of Spillway Road; **location 2 (8a)**: Hayton School Road, ca. 0.2 km north of Falcon Road; **location 3 (8a)**: Hayton School Road, ca. 0.1 km north of Falcon Road; **location 4 (8a)**: CONWR at junction of Drew and Falcon roads; **location 5 (8a)**: ditch adjacent to Spillway Road south of Broken Handle Lane; **location 6**: CONWR cattle pond west of Wolf Creek Road; **location 7**: CONWR cattle pond west of Wolf Creek Road; **location 8**: CONWR pond east of Wolf Creek Road; **location 9**: CONWR pond east of Wolf Creek Road; **location 10**: CONWR pond east of Wolf Creek Road; **location 11**: frogs calling from unknown location off Spillway Road west of Lakewood subdivision; **location 12**: frog found on Wolf Creek Road at General Dynamics plant on CONWR; **location 13 (8a)**: pond on south side of Hayton School Road, 0.3 mile west of Spillway Road.

I investigated *Rana areolata* sites in Williamson County on 13 October 2006, 27 February 2007, 18 March 2007, 28 March 2007, and 5 April 2007.

On 13 Oct 2006, I examined sites near the west side of Crab Orchard Lake and off/near Spillway Road. I began by investigating Brandon and Altig's site near the sailboat basin. The site is a shallow, forested (pin oak and red maple) pond on the south side of the road to the marina, just east of Spillway Road (37°44.298N, 89°08.764W). Due to shading, the basin contains no herbaceous vegetation. The understory of the surrounding closed canopy forest is thickly vegetated with *Viburnum recognitum*. A ditch appears to drain the water from the pond into Crab Orchard Lake. Should this be the case, the hydroperiod of this site may now be too short for successful *Rana areolata* reproduction.

In 1965, Ronn Altig collected a specimen "on road along west side of Crab Orchard Lake." I contacted Dr. Altig, but he was unable to provide additional details regarding this observation (personal communication 2006). I attempted to locate a small pond indicated on the topographic map as occurring in the area, but was unsuccessful. The pond may have been destroyed. Despite numerous passes by this site on the way to sites to the southeast, neither Mike Redmer or myself have seen or heard crawfish frogs along the west side of Crab Orchard Lake. As such, they may no longer inhabit this area.

My next stop was the *Rana areolata* breeding site in the isolated portion of Crab Orchard National Wildlife Refuge, northeast of the junction of Falcon and Drew roads (37°41.736N, 89°08.150W). This is one of Redmer's sites and Fairbairn and Lips' location 4. I have also heard *Rana areolata* here. This pond, constructed at the head of a drain, is vegetated with lotus, *Gratiola*, smartweed, and Echinochloa. It occurs within an autumn olive-invaded *Solidago*-dominated oldfield. A small woodlot occurs nearby to the southeast (appears to be a former homestead).

I then investigated a small pond just northwest of the junction of Drew Road and Falcon Road (37°41.680N, 89°08.571W). This is a Redmer site. The pond is constructed on the slope of an east-facing hill. It is flanked by willows, some of which also grow in the basin. There is almost no herbaceous vegetation present. A green plastic pipe opens onto the pond, suggesting input of gray-water or sewage from the house trailer upslope. The pond is bordered to the west, north, and east by autumn olive-invaded oldfield, and by shrubby young woods to the south. Looks like a suboptimal *Rana areolata* breeding site.

My next stop was a small pond on the west side of Hayton School Road, 0.1 mile north of Falcon Road (37°41.795N, 89°07.374W). This site corresponds to Redmer specimens SIUC 4390-91 and to Fairbairn and Lips' locations 2 and/or 3. When visited, the pond contained black, foul-smelling water, which suggested sewage input. It is heavily shaded by willows, silver maples, pin oaks, and sycamores and contains no herbaceous vegetation. It occurs within the floodplain of a small, intermittent stream that more or less parallels the road. The habitat is oldfield and low woods comprised of willow, American elm, sassafras, box elder, sycamore, and autumn olive. Across the road, to the east, are small homes with large, sparsely wooded lawns. This is another, apparently suboptimal, *Rana areolata* breeding site.

I then stopped at the junction of Broken Handle Lane and Propeller Point (Fairbairn and Lips' location 1; 37°42.08N, 89°06.48W). Fairbairn heard *Rana areolata* calling while at this location, but did not determine the location of the breeding site. Mike Redmer (personal communication) indicated to me that *Rana areolata* used a small pond indicated on the topographic map approximately 0.1 mile northeast of the junction of these two roads. The habitat here is a mixture of cropland and shrubby oldfield.

I then stopped on Spillway Road adjacent to a low area in a cropfield to the west. This is location 5 of Fairbairn and Lips (2004) and a site where I have frequently heard *Rana areolata* calling in years past (37°41.833N, 89°06.817W). This low spot is vegetated with *Echinochloa*, *Panicum virgatum*, broomsedge, cocklebur, *Bidens*, and short (< 1 m) willows. When full it is confluent with the roadside ditch (personal observation). It is within the cropfield and flanked by the wooded road shoulder. An autumn olive-invaded oldfield occurs to the east, across the road. In 1996, I observed an estimated 2 dozen *Rana areolata* in a small pond approximately 0.15 mile north-northwest of this site. At that time, the nearby house was unoccupied, allowing unhindered access.

My next stop was the small pond on the south side of Hayton School Road, 0.3 mile west of Spillway Road (37°41.414N, 89°07.163W). This is location 13 of Fairbairn and Lips (2004), and a site where both Redmer (personal communication) and I have heard calling *Rana areolata* in the past. The pond is within an extensive cropfield on gently rolling topography, and is lined with

willows. The basin supports a rank growth of *Echinochloa* and cocklebur. To the north, across the road, is an extensive hayfield on gently rolling land.

I did not take gps points at all the locations on Spillway Road and Hayton School Road (i.e., Lakewood Subdivision area) where frogs have been observed over the years by various investigators. Rather, I focused on breeding sites whenever possible. One Fairbairn and Lips (2004) observation (location 16) is of frogs calling in the distance from “unknown location off Spillway Road” west of the Lakewood subdivision (37°42.062N, 89°07.539W). This site, a major bend in Spillway Road, is 0.45 air miles north-northeast of location 4. It is also 0.3 air miles northwest of a pond on private property. Given that *Rana areolata* can be heard from distances greater than 0.5 mile (personal observation), the frogs heard by Amy Fairbairn could have been calling at the known site (location 4) and/or at the site to the southeast. Ponds closer to this location are large and likely stocked with fish.

On 28 February 2007, I investigated six Fairbairn and Lips (2004) sites on Crab Orchard National Wildlife Refuge, south of Crab Orchard Lake, in the vicinity of Wolf Creek Road.

Location 6 is a small pond in cattle pasture west of Wolf Creek Road (37°41.860N, 89°03.582W). This pond is fully accessible to cattle and has severely eroding banks. The water, churned by the strong wind from the south, is turbid-brown. There is very little herbaceous vegetation in the water. Although Amy Fairbairn heard crawfish frogs calling here, it is not an ideal breeding site due to the paucity of inundated vegetation.

Location 7 is a larger pond in the same cattle pasture as location 6 (37°41.802N, 89°03.620W). This pond, however, is protected from the damaging impact of cattle by a barb-wire fence that surrounds it. On the south side of the pond, the fence extends down into about 1/10 of the pond basin allowing cattle access to water. The water is not as cloudy as Location 6, and I could see *Ambystoma* spermatophores and egg masses. The pond contains last year's leafless stems of what appears to be smartweed. This site, although also sparsely vegetated, looks better for crawfish frogs than Location 6.

I then investigated the fish-rearing ponds east of Wolf Creek Road where Amy heard *Rana areolata* calling in 2004 (Locations 8 and 9). The two ponds are adjacent to each other, separated by an earthen berm. The northern basin is at 37°41.738N, 89°03.385W and the southern basin is at 37°41.675N, 89°03.364W. The southern basin is square in shape. The northern basin is very sparsely vegetated (few stems of dead herbaceous plants and algae), whereas the southern basin appears free of vegetation (however, piles of cocklebur fruits piled along the basin edge suggest that the basin was full of cocklebur in the past). The basins are at the low end of a slope planted to prairie grasses and forbs (burned in early spring 2007). According to refuge biologist, Mike Brown, both

basins are fishless in early spring, during the *Rana areolata* breeding season. The basins are stocked later in the spring with largemouth bass fry. As a result, these ponds may act as reproductive sinks for the crawfish frogs that breed here.

I then traveled further south on Wolf Creek Road to Fairbairn and Lips (2004) Location 11. This site is east of Wolf Creek Road, in a field of corn and at the head of a wooded drain (37°40.822N, 89°03.416W). The west half of the pond is well-shaded by willows, red maple, pin oaks, and locust. The east half is treeless, and vegetated with buttonbush and some inundated graminoids. I saw larval *Ambystoma opacum* on the east side of the pond.

I also examined a pond near the west side of Wolf Creek Road, north of Crab Orchard Lake (37°43.188N, 89°03.529W). Amy Fairbairn observed a crawfish frog on the road in the vicinity of this pond in 2004 (Location 12). The pond is within a corn field on gently rolling topography. A wide (>10 m) band of fescue surrounds the pond, separating it from the corn field. Based on the heavy growth of floating algae near the banks of the pond, it appears that the pond receives fertilizer run-off from the field.

On 28 March 2007, I looked for *Rana areolata* habitat in the vicinity of Herrin. The Herrin area was once a hotbed for *Rana areolata* collectors. Numerous specimens were collected in the late 1930s (Smith et al. 1948). I previously examined the south side of Herrin after dark (19 March 2007), listening for frogs at various points both east and west of Highway 148. I heard numerous spring peepers and chorus frogs, but no crawfish frogs. I searched elsewhere today, principally on the northeast side of town. I looked at a pond at the southwest corner of the Herrin Cemetery (37°47.619N, 89°00.436W). About half of the pond (west side) has been recently filled with dirt. The pond occurs near a cul-de-sac in a developing subdivision. The remaining unfilled pond is bordered by mature red maples which produce enough shade to render the pond vegetationless. The pond's suitability for *Rana areolata* prior to partial filling is unknown. I observed no amphibian life despite the clear water. There are numerous new and developing subdivisions on this side of Herrin.

I then examined two ponds east of Carrol Street, < 0.1 mile north of Herrin Road. The first is heavily shaded by pin oaks (37°48.692N, 89°00.649W). I saw several adult *Rana sphenoccephala*, but no egg masses. However, egg masses would have been easy to miss given the darkness of the tannin-stained water. The pond contains no herbaceous vegetation, just leaf and branch litter. The suitability of such a pond for *Rana areolata* is unknown. I also examined a second wooded pond immediately north of the first (37°48.755N, 89°00.616W). This pond is forested with red maple and willow. However, enough light penetrates the south side to permit a small amount of grass to grow. The bottom is principally covered with leaf and branch litter, however. The water is not darkly stained and I saw *Ambystoma texanum* embryos developing in their jelly masses. I did not see any frog eggs. Both of these ponds are within a cropland pocked

with crawfish burrows of varying sizes. I saw nothing of interest on the west side of Herrin. On my drive south, out of town, I passed a low horse pasture on the east side of Highway 148, 0.4 mile north of Grand Road. The portion of the pasture adjacent to the east side of the road was flooded and looks good for frogs, possibly even *Rana areolata*. Overall, the likelihood of *Rana areolata* still occurring with the city limits of Herrin is low. However, *Rana areolata* may occur in the surrounding rural landscape.

My next stop was Bob Lacy's site near Lake of Egypt. Bob has observed crawfish frogs on Cobb Hill Road at 37°36.612N, 88°54.374W. There is no pond immediately adjacent to the road at this location. An extensive, cattle pasture on rolling topography occurs downslope to the east. The area west of the road appears to be used for hay production. There are numerous thickets of red cedar and autumn olive in the hayfield. There is a farm pond in this field, < 0.2 mi west from Lacy's spot (37°36.705N, 88°54.517W; taken on road). If the pond is fishless, it could be a suitable site for *Rana areolata*.

My last stop was the property of Tim Moss, south of Crab Orchard National Wildlife Refuge and about 1 mile west of highway 148. This property used to belong to the Woolard family. Dan Woolard observed *Rana areolata* in a goose pit on the property in the late 1970s. Unfortunately, the Woolard goose pits no longer exist. The only water bodies on the property now are fish ponds. I took a gps point near the junction of the 3 smaller ponds (37°39.050N, 89°02.315W). Portions of the smaller ponds are well vegetated with water primrose which potentially could provide cover for *Rana areolata* tadpoles. Crawfish burrows are extremely abundant in the adjacent uplands (grass or cropland). I talked briefly with Tim Moss's grown son, Cole. After I imitated the call of *Rana areolata*, he told me he has heard them while at home (i.e., they still occur nearby). Crawfish frogs likely breed in a neighbor's fishless pond. Those observed by Woolard may have been transients or individuals that inhabited burrows on the Woolard property but bred offsite. Alternatively, *Rana areolata* is capable of successful reproduction in the smaller fish ponds as a result of sufficient herbaceous cover.

On 5 April 2007, I looked for potential *Rana areolata* habitat in the vicinity of Buchanan Street in Marion. I drove Buchanan street southward from Main Street. Both sides of Buchanan Street are bordered by closely-spaced houses. However, near the end of Buchanan Street, at Lewis, I found a mesic, low-lying woodland dominated by red maple. The wooded area is east of Buchanan in the floodplain of a small stream. Just southeast of the junction of Buchanan and Lewis is an elongate pool (southeast of Messiah Christian Church). This pool is bordered on the west side by a mowed area having numerous crawfish burrows and the woodland on the east side (37°43.200N, 88°55.453W). The pool bottom is principally covered by leaf litter. However, there is sparse herbaceous vegetation including grass, *Gratiola*, *Potamogeton*, and *Juncus*. This site has low potential as a *Rana areolata* breeding site. A small creek lies just east and south of this pool and cropland occurs beyond the stream. I also examined a

larger wetland to the southwest, just south of the creek (37°43.072N, 88°55.536W). This pond, within a low, mesic red maple woods, is vegetated with buttonbush, smartweed, and *Rumex*. Based on piles of cornstalks and other debris, this wetland appears to receive floodwater from the nearby stream. As such, it is likely to be inhabited by fish and is less likely to be used by *Rana areolata*.

On 5 April 2007 I investigated the site “two miles north of Johnston City High School.” I drove north from the high school on Monroe Street, which borders the east side of the school. At 1.6 miles north I observed a small pond in a pasture on rolling topography west of Monroe (37°50.885N, 88°55.432W; taken at edge of fence near road). Herbaceous vegetation occurs throughout the pond. Beyond the pasture, to the west, is a cropfield. East of the road is a fescue-broomsedge field. This pond is potentially a *Rana areolata* breeding site. Extensive grassland (former pasture?) borders the east side of the road, 2.0 miles north of the high school. A narrow, wooded stream valley borders the west side of the road, beyond which is more grassland. I did not see any ponds.

I was unable to assess Blanford and Burke's 1994 site (SIUC 4646; described as “0.25 mile west of Spillway Road on 151”), because I was unable to find a road labeled 151 on any map.

DISCUSSION

The loss of habitat, both non-breeding and breeding, is undoubtedly the single greatest cause of amphibian declines in the state of Illinois. Although largely undocumented, *Rana areolata* has likely declined in distribution and abundance in Illinois in concert with loss of habitat. The loss of *Rana areolata* habitat in Illinois, and the subsequent decline in numbers of frogs observed, was noted by Thompson as early as 1915. Thompson stated that *Rana areolata* in the vicinity of Calhoun, Richland County, was “yearly becoming more rare.” She went on to say that “this is to be expected since more of the land is being cultivated, and the frogs are killed in comparatively large numbers each year by the plows and mowers. We found them much more numerous in the meadows than in the cultivated fields, and it was evident that with the continued breaking up of the meadows the species would become even more rare in the region.”

Smith (1961), in his monograph on the amphibians and reptiles of Illinois, described Illinois as “a great corn desert containing remnants of many habitat types.” Nonetheless, his perception of the status of *Rana areolata* in Illinois at the time was “much more common than the [distribution] map indicates.” Indeed, *Rana areolata* may still be much more common than perceived due to its secretive nature outside the breeding season, relatively abbreviated breeding period, and somewhat unpredictable breeding behavior. As a result, the presence or absence of *Rana areolata* at a particular location can sometimes be difficult to ascertain. For instance, chorusing intensity is extremely variable

during the early spring breeding period (Busby and Brecheisen 1997). As a result, poorly-timed vocalization surveys can miss frogs that are present.

I believe, based on observations made during my travels throughout the range of *Rana areolata* in Illinois, that suitable habitat has been reduced in extent since Smith's (1961) work. *Rana areolata* is perceived to be principally a species of prairies having clay-pan soils (Smith 1961, Busby and Brecheisen 1997). The species often finds human-made grasslands, especially pastures and hayfields on clay-pan soils, a suitable substitute for prairie when temporary pools and fishless stock-watering ponds are available for reproduction. However, the extent of grassland, including pasture, has declined precipitously in Illinois (Herkert 1991, Vance 1976). Much former pastureland has been converted to row-crop agriculture, particularly the intensive production of corn and soybeans. For example, the amount of pasture in Illinois declined 76% between 1906 and 1987, and the amount of hayfield declined 53% between 1960 and 1989 (Herkert 1991). As observed by Roseberry and Cole (2006) nearly all fertile, flatland in Illinois has been converted to row crops.

Concurrent with the loss of pasture and other grasslands has been the loss of stock-watering ponds. On numerous occasions, I found that ponds indicated on topographic maps no longer exist. Oftentimes a grassy swale or ditch running downslope through cropland replaced these ponds. Because these swales and ditches are designed to carry water off the land, water does not pool for extended periods of time. As a result, these swales/ditches do not provide adequate amphibian breeding habitat, particularly for a frog with a larval period as long as *Rana areolata*. Considering the extent of farmland in the state of Illinois, the efficiency with which farmers destroy old ponds and de-water their croplands (using ditches and drain tiles) is undoubtedly contributing to the crisis of amphibian declines in the state. Ditches and drain tiles can lower water tables, shortening the hydroperiod of shallow, temporary pools that *Rana areolata* bred in historically (Gloyd 1928, Smith 1934).

As pointed out by Roseberry and Cole (2006), reversing the loss of habitat on fertile, flat ground in Illinois is unlikely under the present agricultural regime. Nonetheless, two government programs, the Conservation Reserve Program (CRP) and Wetland Reserve Program (WRP) have the potential to slow (and perhaps even reverse) the loss of amphibian habitat in Illinois. Such programs need to be encouraged and expanded if we are to stem the tide of amphibian habitat loss. The WRP program, in particular, has been shown to be beneficial to amphibians in Illinois, including *Rana areolata* (Palis 2004). Discouraging farmers from destroying old farm ponds can also be beneficial to amphibians because farm ponds can often be suitable amphibian breeding sites (Knutson et al. 2004).

Given that most privately-held rural properties in Illinois are now less likely to have upland and wetland habitat suitable for crawfish frogs than historically, the

best hope for the continued persistence of the species in Illinois appears to be on public and private conservation lands. Crawfish frogs are known to historically inhabit the following tracts of public and private conservation lands: Crab Orchard National Wildlife Refuge (Williamson County), Dixon Springs Agricultural Center (Pope County), Grassy Slough Preserve (The Nature Conservancy; Johnson County), Prairie Ridge State Natural Area (Jasper and Marion counties), Pyramid State Park (Perry County), Robert Ridgway Grasslands (Illinois Audubon Society; Jasper and Marion counties), and Wayne Fitzgerald State Park (Franklin County). They are known, or likely to still occur, on all tracts except Pyramid State Park. Crawfish frogs may also inhabit Cache River State Natural Area and Cypress Creek National Wildlife Refuge.

Follow-up surveys, designed to determine the presence or absence of *Rana areolata*, are needed at all potentially-inhabited sites observed during this survey, as well as on all tracts of conservation lands (public and private, including those enrolled in CRP and WRP) within the range of the species in Illinois. I also encourage presence/absence surveys throughout the range of crawfish frogs in Illinois, as the species may still be more abundant than presently known.

SUMMARY

Of the 110 sites examined, 78 (71%) have at least some potential to support an extant population of *Rana areolata* (Table 1). *Rana areolata* is likely extirpated at the remainder (29%) of the sites examined (Table 1).

Table 1. Number of historic *Rana areolata* sites, including the number of sites where *Rana areolata* may no longer occur and where *Rana areolata* may still occur. Table includes only those historic sites that were located/evaluated.

County	number of historic sites	number of sites possibly extirpated	number of sites possibly extant
Adams	1	0	1
Alexander	1	0	1
Bond	1	0	1
Clay	1	1	0
Coles	3	1	2
Crawford	1	1	0
Cumberland	7	6	1
Edgar	1	0	1
Fayette	1	0	1
Franklin	1	0	1
Hamilton	2	0	2
Hardin	1	0	1
Jackson	15	9	6
Jasper	10	1	9
Jefferson	5	2	3
Johnson	2	0	2
Lawrence	1	1	0
Madison	1	1	0
Massac	4	0	4
Marion	9	0	9
Montgomery	1	0	1
Perry	3	1	2
Pike	1	0	1
Pope	3	0	3
Pulaski	1	0	1
Richland	5	2	3
Saline	3	1	2
Union	2	0	2
Washington	1	0	1
White	1	0	1
Williamson	21	5	16
Totals	110	32	78

ACKNOWLEDGMENTS

I am especially grateful to Terry Esker for sponsoring this project and securing funding through the Illinois Wildlife Preservation Fund. For sharing locality records or clarifying location of collection sites, I thank Ronn Altig, Ron Brandon, Richard Day, Amy Fairbairn, George Folkerts, Terry Esker, Donovan Henry, Steve Karsen, Edmund Keiser, Jim Lamer, Bob Lindsey, Karen Lips, John Petzing, Chris Phillips, Mike Redmer, Douglas Rossman, John Schwegman, Jody Shimp, and Dan Woolard. John Petzing was particularly helpful in acquiring museum data and references. I thank the following for providing locality data from their respective museum collections: Christopher Austin (LSUMZ), Tim Cashatt (ISM), Craig Guyer (AU), Traci Hartsell (USNM), Toby Hibbitts (TCWC), Kenneth Krysko (UF), Christine Mayer and John Petzing (INHS/UIMNH), Alan Resetar (FMNH), Nelson Rios (TU), Gregory Schneider (UMMZ), Jeff Stewart (SIUC), Steve Sullivan (CA), and Jens Vindum (CAS). For assistance in securing topographic maps I thank Harry Davis and Jan Fiorino at Morris Library. For access to their property I thank Richard Day, Mike Dotson, Mary Jones, Rick Jones, Tim Moss, Mrs. Ragsdale, Nora Renoud, Dick Smith, and Pat Thomas. I thank Mike Brown for access to the closed portion of Crab Orchard National Wildlife Refuge, Mary Trovillion and Butch Hart for help locating particular tracts on the Dixon Springs Agricultural Center, and Erin Palmer for helping me access the wetland mitigation site in Saline County.

LITERATURE CITED

- Applegate, R. D. and C. W. Zimbleman. 1978. Herpetofauna of the Dixon Springs Agricultural Center and vicinity, Pope County, Illinois. Bulletin of the Chicago Herpetological Society 13:72-74.
- Busby, W. H. and W. R. Brecheisen. 1997. Chorusing phenology and habitat associations of the crawfish frog, *Rana areolata* (Anura: Ranidae) in Kansas. The Southwestern Naturalist 42:210-217.
- Christiansen, J. L. and R. M. Bailey. 1991. The Salamanders and Frogs of Iowa. Iowa. Department of Natural Resources Nongame Technical Series No. 3.
- Fairbairn, A. L. and K. R. Lips. 2004. Abundance and distribution of the northern crayfish frog, *Rana areolata circulosa*, in Crab Orchard National Wildlife Refuge. Unpublished report to U.S. Fish and Wildlife Service.
- Gloyd, H. K. 1928. The amphibians and reptiles of Franklin County, Kansas. Transactions of the Kansas Academy of Science 31: 115-141.

- Herkert, J. R. 1991. Prairie birds of Illinois: population response to two centuries of habitat change. Illinois Natural History Survey Bulletin 34, Article 4: 393-399.
- Illinois Department of Natural Resources. 2005. The Illinois Comprehensive Wildlife Conservation Plan and Strategy. State of Illinois, Springfield, Illinois.
- Kentucky Department of Fish & Wildlife Resources. 2007. Species Information: *Rana areolata*. <http://www.gov.kfwis/speciesinfo/specieslist.asp> (accessed 1 February 2007).
- Klimstra, W. D. and M. Hutchison. 1965. A collection of amphibians and reptiles in southern Illinois. Transactions of the Illinois Academy of Science 58:152-157.
- Knutson, M. G., W. B. Richardson, D. M. Reineke, B. R. Gray, J. R. Parmelee, and S. E. Weik. 2004. Agricultural ponds support amphibian populations. Ecological Applications 14:669-684.
- Minton, S. A. 2001. Amphibians and Reptiles of Indiana, 2nd Edition. Indiana Academy of Science, Indianapolis.
- Missouri Department of Conservation. 2007. Missouri Species and Communities of Special Concern. <http://www.mdc.mo.gov/documents/nathis/endangered/checklist.pdf> (accessed 1 February 2007).
- Myers, C. W. and W. D. Klimstra. 1963. Amphibians and reptiles of an ecologically disturbed (strip-mined) area in southern Illinois. American Midland Naturalist 70:126-132.
- Palis, J. G. 2004. Herpetofaunal colonization of three newly constructed wetlands on Grassy Slough Preserve, Johnson County, Illinois: 2001-2004. Report submitted to the Illinois Chapter of The Nature Conservancy, Peoria.
- Peters, J. A. 1942. Reptiles and amphibians of Cumberland County, Illinois. Copeia 1942:182-183.
- 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.
- Roseberry, J. L. and J. Cole. 2006. The bobwhite in Illinois. Illinois Department of Natural Resources, Springfield, Illinois.

- Smith, H. M. 1934. The amphibians of Kansas. The American Midland Naturalist 15:377-527.
- Smith, H. M., C. W. Nixon, and P. E. Smith. 1948. A partial description of the tadpole of *Rana areolata circumlosa* and notes on the natural history of the race. The American Midland Naturalist 39:608-614.
- Smith, P. W. 1947. The reptiles and amphibians of eastern central Illinois. Bulletin of the Chicago Academy of Sciences 8:21-40.
- Smith, P. W. 1953. A distributional and variational study of the adult amphibians of Illinois. Masters thesis, University of Illinois.
- Smith, P. W. 1961. The Amphibians and Reptiles of Illinois. Illinois Natural History Survey Bulletin 28:1-298.
- Thompson, C. 1915. Notes on the habits of *Rana areolata* Baird and Girard. Occasional Papers of the University of Michigan Museum of Zoology 9:1-7, + plates.
- Vance, D. R. 1976. Changes in land use and wildlife populations in southeastern Illinois. Wildlife Society Bulletin 4:11-15.