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Currently there is little doubt among the scientific community of the decline of amphibians on an international scale (Berger et al. 1998, Kuzmin 1994, Laurance et al. 1996, Lips 1998) and across North America (Delis et al. 1996, Drost and Fellers 1996, Lannoo 1994). In light of these widespread declines it is essential that current populations be inventoried and evaluated so that future population changes can be detected and hopefully correlated with possible causes. Critical baseline information is lost when monitoring is not implemented until after a problem is detected. The effectiveness of long-term studies in detecting amphibian declines (Beebee 1997, Lannoo et al. 1994) and distinguishing declines from population fluctuations (Pechmann 1991) has been demonstrated. Some states have initiated amphibian monitoring programs afrer the incidence of declines or malformities reached high levels. A goal of all states should be the insritution of programs that would work together to monitor amphibian populations as a whole to determine causes of declines and malformities more efficiently. The amphibian and reptile species of the middle Kaskaskia River drainage of Illinois had been poorly known prior to this inventory. Most of the land in the study area is privately owned and is inaccessible to the public, possibly accounting in part for the lack of herpetofaunal records. The main goals of this project were to (1) inventory the amphibians and reptiles of the Kaskaskia study area, (2) voucher any species that had not been recorded in the vicinity previously or since 1960, and (3) locate amphibian breeding habitats.

METHODS

The study area along the Kaskaskia River in Illinois includes sections of Clinton, St. Clair, and Washington counties (Fig. 1). Clinton County is the leading Illinois county in wetland acreage with 14,367 ha representing 3.0% of the state's total. St. Clair County is ranked third in the state with 13,683 ha, which is 2.9% of the state's wetlands and Washington County is ranked 20th with 7699 ha or 1.6% of the total wetlands (Illinois Department of Natural Resources 1996).

The Kaskaskia River floodplain in this area is unique because the river remains unrestrained by levees unlike other Illinois rivers. The lack of levees allows for a semi-natural flooding regime to occur over the floodplain (Robinson 1997). Most of the habitat in the study area is floodplain forest, which contains numerous semi-permanent wetlands, such as wooded pools and buttonbush swamps, and more permanent oxbows. The upland oak-hickory forests include flatwoods with sphagnum moss vernal pools, woodland ponds, and in the more developed areas, man-made pools and ponds.

Three main study sites (Fig. 1) were investigated; all three sites are located approximately 40 km southeast of East St. Louis near Interstate 64 and lay within the largest unfragmented forest tract in Illinois. The tract is known as the Kaskaskia Bottoms and is one of 30 resource rich areas in the state identified by the Illinois Department of Natural Resources and The Nature of Illinois Foundation (1996). The 121–324 ha study sites were referred to as "Damiansville," "Venedy," and "Fayetteville." The Damiansville site is located 5.5 km east-southeast of the town of Damiansville and is mostly floodplain forest with some post oak flatwoods, agricultural fields, pastures and residential openings. The Venedy site, 3 km north of the town of Venedy, has extensive unlogged and some logged floodplain forest, numerous post oak flatwoods, a few agricultural fields and residential openings. The Fayetteville site, located 5.5 km northeast of the town of Fayetteville, consists of floodplain forest, much of which has no recent logging history, and two stands of post oak flatwoods near agricultural fields.

The study sites were visited from late April through September, 1997 resulting in over 350 h of field time. Surveys continued throughout the spring and summer of 1998. Six survey methods were used during this inventory: visual encounter surveys (VES) of the terrestrial habitats, road surveys for live and road-killed animals, anuran call surveys at potential breeding habitats, and dipnetting, seining, and wire minnow trapping in aquatic habitats. Of the time spent in the field, 14.5 h of road surveys, 208.5 VES person-h, 4.75 h of seining effort, 3.25 h of anuran call surveys and 432 h of trapping with minnow traps were completed.

Voucher specimens were deposited in the amphibian and reptile collections of The Illinois Natural History Survey (INHS) at Champaign and Southern Illinois University at Carbondale. New county records were verified with the Illinois Herpetological Database at the (INHS), which contains data on Illinois amphibian and reptile species from 30 U.S. collections. A web page developed from the database provides county-level distribution data for Illinois herpetofauna and is accessible through the URL http://www.inhs.uiuc.edu/cbd/herpdist/herp.html

RESULTS AND DISCUSSION

In all, 35 species of amphibians and reptiles were recorded over a 2-yr period which included 25 new distribution records (Table 1) and one new species record for the Kaskaskia River drainage; *Thamnophis proximus*. Thirty-four species were observed during 1997; voucher specimens of 31 species were preserved with the vouchers consisting of eight frogs, four salamanders, five turtles, 12 snakes, and two lizards. The collection of the these species resulted in 14 new amphibian and 11 new reptile county records, including the extension of the known Illinois ranges of *Ambystoma maculatum, A. opacum,* and *Notophthalmus viridescens*. Fieldwork during the spring

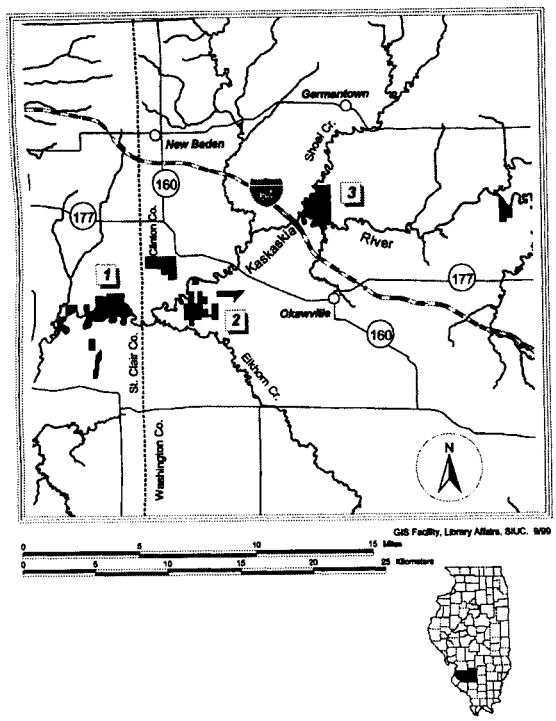

Fig. 1. Location of three main Kaskaskia River drainage survey sites and other areas sampled.

and summer of 1998, added *Siren intermedia* to the cumulative and voucher lists. A voucher photo of *Lampropeltis triangulum syspila* (INHS 1999–9) donated by land owners is deposited in the INHS Herpetological Slide Catalogue. During the same period five more county records were added to the list from Clinton and Washington Counties. Details regarding the new distribution records can be found in Petzing et al. (1998) and Wilson (1999).

Some species of amphibians were encountered more frequently in certain aquatic breeding habitats. Among the floodplain habitats, the dominant species in buttonbush swamps was *Rana sphenocephala,* and in oxbow ponds *R. sphenocephala* and *R. catesbeiana* were the most abundant species. Surveys of the upland habitats resulted in the following habitat/dominant species relationships: sphagnum moss pools—*Pseudacris crucifer,* woodland pools—*A. opacum* and *A. texanum,* farm ponds—*Acris crepitans* and *R. catesbeiana,* and ditches and field pools—*Pseudacris triseriata* and *Bufo americanus.*

Actual numbers and percentages of the 35 amphibian species present in the area detected by each survey method were, respectively: VES—32 (91%), road surveys—25 (66%), anuran call surveys—8 (23%), seining—10 (29%), dip netting—8 (23%), and minnow traps—4 (11%). The results support the premise that an array of survey techniques is the best approach in detecting as many species as possible when performing an inventory.

None of the study sites were lacking in either permanent or seasonal floodplain amphibian breeding habitats. The Venedy site had the greatest amount of upland amphibian breeding habitat with over 20 distinct vernal pools of which half appeared to be of natural origin. The Damiansville site supported seven vernal water areas, one appearing to be a natural depression with the remainder being roadside ditches, ruts, and excavated holes. The Fayetteville area lacked natural upland pools but did have at least three vernal water areas outside of the floodplain consisting of ditches and an excavated water hole.

Table 1. Amphibians and reptiles observed in the Kaskaskia River drainage during 1997–98 and their relative abundances. Species names followed by an asterisk were not vouchered; double asterisks represent photo vouchers. New county records are represented by their respective county symbols; Clinton (C), St. Clair (S), and Washington (W) counties.

Caudata	
Ambystoma maculatum (spotted salamander) C, W	common
Ambystoma opacum (marbled salamander) C	abundant
Ambystoma texanum (smallmouth salamander) W	abundant
Notophthalmus viridescens (central newt) W	rare
Siren intermedia (lesser siren)	uncommon
Anura	
Acris crepitans (Blanchard's cricket frog) C	abundant
Bufo americanus (American toad) C, S	common
Bufo woodhousii (Fowler's toad) W	abundant
Hyla chrysoscelis (Cope's gray treefrog) S	abundant
Pseudacris crucifer (spring peeper) C	common
Pseudacris triseriata (western chorus frog) C	abundant
Rana catesbeiana (bullfrog) C	common
Rana sphenocephala (southern leopard frog) C	abundant
Testudines	
Chelydra serpentina (common snapping turtle) C	uncommon
Chrysemys picta (painted turtle)	common
Graptemys kohnii (Mississippi map turtle)*	rare
Graptemys pseudogeographica (false map turtle)*	uncommon
Sternotherus odoratus (common musk turtle)	rare
Terrapene carolina (eastern box turtle) C	common
Trachemys scripta (red-eared slider)	common
Lacertilia	
Eumeces fasciatus (five-lined skink)	uncommon
Eumeces laticeps (broadhead skink) S, W	uncommon
Serpentes	
Coluber constrictor (racer)	uncommon
Elaphe obsoleta (rat snake)	common
Heterodon platirhinos (eastern hognose snake)	rare
Lampropeltis calligaster (prairie kingsnake)	uncommon
Lampropeltis triangulum syspila (red milk snake)**	rare
Nerodia erythrogaster (plainbelly water snake) C	common
Nerodia rhombifer (diamondback water snake) C, W	uncommon
Nerodia sipedon (northern water snake) C	common
Regina grahamii (Graham's crayfish snake) C	rare
Storeria dekayi (brown snake) C	uncommon
Storeria occipitomaculata (redbelly snake) W	rare
Thamnophis proximus (western ribbon snake)	rare
Thamnophis sirtalis (common garter snake)	uncommon

Anuran deformities were encountered on two occasions. The first occurrence, collected in the floodplain of the Washington County study area near Calamus Lake, was a recently metamorphosed *R. sphenocephala* (INHS-13139) bearing what appears to be an extra torso with hind limbs. The second occurrence, captured in a tire rut on a mud road in Clinton County, was a metamorphosing *H. chrysoscelis* (INHS-13275) missing an eye. Both deformities were reported to the North American Reporting Center for Amphibian Malformations in Jamestown, North Dakota.

Preliminary fieldwork has revealed that amphibian habitats are diverse and widespread at the Kaskaskia study sites. The lack of levees has probably played a major role in keeping the floodplain from being converted to croplands and thus allowed the swamps and oxbows to remain intact. It appears that land management, such as

construction of wildlife watering holes and floodplain waterfowl habitat, has increased amphibian breeding habitat, at least for some species. The number of new distribution records gathered during the two years indicates that even in the central United States the herpetofauna remain poorly sampled in certain areas.

Some studies have shown that acidity can influence the effects of metals on the development and survival of amphibians (Freda et al. 1990, Freda and McDonald 1990). Other studies have implicated chemicals as potential dangers to amphibians (Bidwell and Gorrie 1995). Considering this knowledge any long-term amphibian monitoring program should include environmental data recording of parameters such as pH, chemicals and dissolved metals.

Some of the species that were expected but not found included *Ambystoma tigrinum,* and *Plethodon glutinosus.* The lack of *A. tigrinum* was probably due to the fact that very few suitable breeding ponds in the few open grass and field habitats sampled. *Plethodon glutinosus* occurs in the surrounding counties upstream and downstream of the study area; therefore, their occurrence is expected in this region. Their absence is consistent with their typical association with rocky areas (Smith 1961). Turtle traps were not employed in the current survey, but when implemented will most likely reveal more cryptic species such *Apalone spinifera, Chelydra serpentina* and *Sternotherus odoratus* to be more numerous than observed.

Some potential threats to this area of the Kaskaskia River exist. These threats include the encroachment of development which could be spurred by the recent construction of the Mid America Airport located within 15 km to the northeast of the study area. Other threats might include chemical runoff from agricultural fields and fish introductions to upland pools.

Many of the participants in this study are now more aware of the important roles their wildlife watering holes are playing in the ecosystem and are quite interested in the herpetofauna revealed to them. A potential for long term monitoring has been established in this area since it appears that many landowners of large tracts of potential habitat are interested in keeping this area intact. Land management comparison studies of this area to other similar sized river systems would be interesting and beneficial in the formulation of future restoration plans of riparian, amphibian habitats in other areas.

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