STATUS AND DISTRIBUTION OF THE RUSTY CRAYFISH, *ORCONECTES RUSTICUS*, IN ILLINOIS

Center for Biodiversity Technical Report 1995(15)

29 September 1995

Prepared by

Christopher A. Taylor and Micheal Redmer*
Center for Biodiversity
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, IL 61820

***Department of Zoology**
Southern Illinois University at Carbondale
Carbondale, IL 62901

Submitted to:

Wildlife Checkoff Program
Illinois Department of Natural Resources
Division of Natural Resources
524 S. Second Street
Springfield, IL 62701

ABSTRACT

Over the past 30 years the rusty crayfish, *Orconectes rusticus*, has greatly expanded its North American range, first appearing in Illinois waters in 1973. Since then it has rapidly expanded its range in the northern half of Illinois. We report here the results of field work conducted from June 1994 to September 1995 to determine the current range and population sizes of rusty crayfish in Illinois and to ascertain if displacement of native Illinois species by rusty crayfish is occurring. After sampling over 90 sites it is apparent that the rusty crayfish occurs commonly in large portions of the Kishwaukee and Rock River drainages and in restricted portions of the Des Plaines, DuPage, Fox, Kankakee, and Vermilion River drainages. An isolated population is also recorded from the Illinois River drainage. Displacement of the native *Orconectes propinquus* and *O. virilis* is noted at several sites.

CAVEAT

This study concentrated primarily on the distribution of *Orconectes rusticus* in Illinois' streams. We sampled only a few of the hundreds of ponds and lakes in the state, hence, numerous populations may have gone unrecorded, particularly in the Cook, DuPage, and Lake county area. Future efforts will undoubtedly reveal the presence of the species in new locations and we ask that this information be sent to us by citizens, resource managers, and biologists as it becomes available.

INTRODUCTION

Within the past 25 years the rusty crayfish, *Orconectes rusticus* (Girard), has rapidly expanded its range in North America. This rapid expansion has made it difficult to determine the species native range. Originally described from the Ohio River at Cincinnati by Charles Girard in 1852, *O. rusticus* is thought to have occurred natively in the Ohio River and its tributaries in Michigan, Ohio, northern Kentucky, and Indiana (Creaser 1931, Page 1985). As a result of introductions, the species is now known to occur in Illinois (Page 1985), New Mexico (Bouchard 1977), Minnesota (Gunderson 1995), Wisconsin (Capelli and Munjal 1982), New England (Crocker 1979), and Ontario (Crocker and Barr 1968). The use of *O. rusticus* as fishing bait has been implicated as the primary dispersal mechanism of the species (Hobbs III et al. 1989, Page 1985).

Orconectes rusticus was first recorded from Illinois in 1973 from Peoria Lake, a 1 to 1.5 mile wide section of the Illinois River in Tazewell County. After conducting a statewide survey of Illinois aquatic Malacostraca from 1972 to 1982, Page (1985) reported *O. rusticus* from seven locations, including the Peoria Lake site (Fig. 1). A single specimen from Quincy, IL, reported as *Cambarus placidus* by Hagen (1870) and plotted as *O. rusticus* by Page (Fig. 147, 1985), is assigned to *O. placidus* by us after examination of the specimen (housed at The Museum of Comparative Zoology, Cambridge, MA). Duplicating patterns of range expansion and native

species displacement observed in Wisconsin (Capelli and Munjal 1982), *O. rusticus* has recently appeared in several new areas of northern Illinois. We present here the results of field work conducted from June 1994 to September 1995 to determine the current range and population sizes of *O. rusticus* in Illinois and to ascertain whether displacement of native Illinois species by *O. rusticus* is occurring. Illinois records for rusty crayfish obtained through other sources are also presented and discussed. This report is submitted as the final report in fulfillment of an agreement with the Illinois Department of Conservation (now Department of Natural Resources) Division of Natural Heritage and the University of Illinois Board of Trustees.

DESCRIPTION AND LIFE HISTORY

Rusty crayfish typically have a greenish brown to reddish brown color to the dorsal surfaces of the abdomen, carapace, and chelae. Single rusty brown spots are typically present on the posterior lateral surfaces of the carapace. Rusty brown spots or blotches are usually also present on the lateral and dorsal surfaces of the abdomen. Fingers of the chelae have red or orange tips with black subdistal bands. The lateral surfaces of chelae of some individuals found in clear water are light blue. The gonopod of the form I (reproductively mature) male has angular shoulder on the dorsal surface and terminates in two long elements that reach the coxae of the second pereiopods with the abdomen flexed. The scelerotized central element is curved at its tip. The gonopod of the form II (reproductively immature) male is slightly shorter in overall length and lacks scelerotization of the central projection. In addition to the rusty brown spots on the carapace, the form I gonopod with an angular shoulder that reaches the coxae of the second pereiopods distinguishes *O. rusticus* from all other Illinois crayfish species.

In Illinois mating most likely occurs in the fall with oviposition occurring in the late spring. Page (1985) reported form I males from August and September and no ovigerous females.

Using data from fish ponds in Ohio, Langlois (1935) reported mating of *O. rusticus* in September and October and most oviposition occurring in April and May. Prins (1968) found spawning peaks to occur in September and October for *O. rusticus* in a Kentucky stream. He also reported females ovipositing from February through May, the number of ovarian eggs was directly related to body size, the number of abdominal eggs was less than the number of ovarian eggs, ovarian egg counts ranged from 54 - 357, abdominal egg counts ranged from 42 - 231, eggs hatch in May after being carried by the female for 4 -6 weeks, and sexual maturity is reached at about 15 months. Hobbs and Jass (1988) and Lorman (1980) present detailed life history information on *O. rusticus* in Wisconsin.

METHODS

A total of 94 sites was sampled for crayfishes from 28 June 1994 to 6 September 1995 (Appendix 1, Figure 2). Sites with suitable habitat were selected for sampling based on proximity to historical localities for *O. rusticus* (i.e. sites in the same river drainage or sites in the general area of known rusty crayfish populations). In an effort to document displacement of native species, several historical localities were also sampled.

Crayfishes were collected using a standard 3.1m minnow seine with 4.8 mm mesh. Voucher specimens of each crayfish species collected were preserved in the field with 10% formalin and were later transferred to 70% ethyl alcohol. All voucher specimens were deposited in the Illinois Natural History Survey (INHS) Crustacean Collection. Population sizes of *O. rusticus* were estimated at selected sites by measuring an area of given size and then seining that area until no more individuals were collected. Notes on the habitat where *O. rusticus* occurred were kept.

While the Des Plaines, Kankakee, and Fox Rivers are parts of the Illinois River drainage, for this report we treat each as separate entities and define the Illinois River drainage as the Illinois River and tributaries which are not part of major drainage systems.

RESULTS

During the course of this study *O. rusticus* was collected at 37 sites in Illinois, 30 of which represent previously unrecorded locations for the species (Figure 2). The species is reported here for the first time from the Des Plaines, DuPage, Kankakee, and Vermilion River drainages of Illinois. Since Page's (1985) statewide survey of Illinois Decapods, *O. rusticus* has greatly expanded its range in the Fox and Rock River drainages and continues to occur in the Illinois River and Lake Michigan drainage. Site numbers discussed correspond to those listed in Appendix 1.

DISTRIBUTION

In the Lake Michigan drainage *O. rusticus* was collected from two sites: Wolf Lake (site 93) and Lake Michigan at Jackson Park (site 94), Cook Co., Chicago. At both sites *O. rusticus* was the only crayfish collected. Page (1985) reported *O. rusticus* from Wolf Lake and Lake Michigan 1 mile east of Burnham Harbor. The Jackson Park site is approximately six miles south of Burnham Harbor. We also report here the 1995 collection of a single *O. rusticus* by SCUBA divers from Lake Michigan 2.5 miles northeast Chicago's Navy Pier at a depth of 48 feet.

Collections of *O. rusticus* from the Des Plaines River drainage since Page (1985) include nine sites in northern Lake County, Black Partridge Creek in extreme west central Cook and southeastern DuPage counties, a small lake in Wood Dale Grove Forest Preserve DuPage County, and three sites in the Joliet Arsenal area of southwestern Will County. For this study *O. rusticus* was collected from two tributaries (sites 66 and 67) of the Des Plaines River in Lake County. The

species was abundant at both sites. *Orconectes virilis* was collected in much smaller numbers from site 67.

Orconectes rusticus was first collected from the DuPage River drainage in 1991, in the West Branch DuPage River, DuPage County. Prior to this study the species has also been collected from Kress Creek in western DuPage County and East Branch DuPage River just north of the DuPage-Will County line. We collected *O. rusticus* at two sites in the West Branch DuPage River (sites 78 and 79) and two sites in the East Branch DuPage River (sites 73 and 80). Other species collected sympatrically with *O. rusticus* include *Procambarus acutus* at site 73; *O. propinquus* at site 80; *O. propinquus* at site 79; and *P. acutus*, *O. propinquus*, and an *O. rusticus* x *O. propinquus* hybrid at site 78. At sites 73, 78, and 80, *O. rusticus* was the most abundant species, comprising over 75% of all crayfishes collected.

Page (1985) reported *O. rusticus* from three sites in the Fox River drainage: Eagle Creek in northwestern Lake County, backwater of Fox River in northwestern Lake County, and Nippersink Creek in northeastern McHenry County. An additional collection of the species was made in 1991 from Squaw Creek in northwestern Lake County. We collected *O. rusticus* from two tributaries of the upper Fox River (sites 83 and 93) and from two sites on the Fox River in Kendall County (sites 90 and 91). Other species collected sympatrically with *O. rusticus* include *O. propinquus* and *O. virilis* at site 90 and *O. virilis* at site 91.

Between 1990 and 1991 *O. rusticus* was collected from four sites in the Kishwaukee River drainage: Piscasaw Creek in northwestern McHenry County, Kishwaukee River in southwestern McHenry and southeastern Winnebago counties, and North Branch Kishwaukee River in central McHenry County. Our field work found *O. rusticus* to be widely distributed and abundant in the drainage. The species was collected at seven sites (sites 39, 40, 41, 42, 44, 46, and 47), six of

which represent previously unreported locations. *Orconectes rusticus* was abundant at all seven sites and was the only species collected at six of the seven. A single *O. virilis* was collected at site 46.

In the Pecatonica River drainage *O. rusticus* was first collected in 1987 from Lake Le-Aqua-Na at Lake Le-Aqua-Na State Park. In 1992 it was collected from Waddams Creek just above Lake Le-Aqua-Na. We collected the species from Waddams Creek approximately 1 mile downstream of the spillway (site 6). *Orconectes propinquus* was more abundant than *O. rusticus* at this site.

Page (1985) reported *O. rusticus* from a single locality in the Rock River drainage, South Fork Kent Creek (reported as Kent Creek) in southeastern Winnebago County. In the time period between the publication of Page (1985) and the initiation of this survey *O. rusticus* has been reported from three different localities: Pierce Lake in northeastern Winnebago County, tributary of Rock Creek just below Lake Carlton in northwestern Whiteside County, and Rock River at Oregon in central Ogle County. We found *O. rusticus* to be widespread and abundant in the Rock River from just South of Rockford to Rock Falls in Whiteside County (sites 48 - 52 and 56). The species was also collected from Pearl Lake and four Rock River tributaries (sites 57 and 59 - 62) in Winnebago County. With the exception of sites 50 and 62, all sites represent new locations for *O. rusticus* in Illinois. At all but site 57 *O. rusticus* was the most abundant species encountered. *Orconectes virilis* occurred in higher numbers at site 57; this species was also collected in small numbers from sites 51 and 52. *Orconectes propinquus* was collected in small numbers from sites 50 and 62. A single *Cambarus diogenes* was collected at sites 52 and 60.

Orconectes rusticus was collected from two sites on the Kankakee River near Kankakee (sites 30 and 31) and from an unnamed tributary at its confluence with the Kankakee River near the Kankakee - Will county line (site 32). These sites represent the first known reported records for the species in the Kankakee River drainage of Illinois. At site 32 *O. propinquus*, *O. virilis*, and *C.*

diogenes were also collected. *Orconectes rusticus* was not collected from the Kankakee River at site 32.

Orconectes rusticus was first collected in the Vermilion River drainage in 1991: Vermilion River in south-central LaSalle County. We found *O. rusticus* to occur in a restricted portion of the Vermilion River from approximately six miles northwest of Streator (LaSalle County) to approximately two miles southeast of Streator (Livingston County), collecting it at two new locations (sites 21 and 23). A single *O. propinquus* collected at site 21 was the only other crayfish collected with *O. rusticus*.

The first known collection of *O. rusticus* from Illinois waters is from a marina on the east bank of the Illinois River at Peoria (Peoria Lake). We found the species to be common at this site (site 15). No other crayfish species were present. Both up and downstream sampling efforts near site 15 failed to reveal the presence of *O. rusticus*.

POPULATION BIOLOGY AND HABITAT

Population estimates of *O. rusticus* were conducted at five sites with density values ranging from 0.4 to 6.2 individuals per square meter (Table 1). Ovigerous females were collected on 31 May 1995 from sites 60 and 62 and on 7 June 1995 from site 40. During this study *O. rusticus* was collected from both lentic and lotic habitats. In lentic habitats the species was usually found along shorelines under concrete rip-rap or cobble larger than 0.1 cubic meters. The Lake Michigan collection from a depth of 48 feet illustrates *O. rusticus*' ability to tolerate a wide range of water depths and pressures. In creeks and rivers *O. rusticus* usually occurred in areas with some degree of current and cobble substrate. The species was occasionally encountered in lotic habitats with gravel substrate and woody debris and was never collected in areas devoid of rock or concrete substrate.

DISCUSSION

In the last ten years *O. rusticus* has rapidly expanded its range in the northern half of Illinois and displaced native species. Our field efforts have found the species to occur in large portions of the Kishwaukee and Rock River drainages and in a single tributary of the Pecatonica River (Fig. 2). Currently this species has restricted distributions in the Des Plaines, DuPage, Kankakee, and Vermilion River drainages (Fig. 2). Two disjunct populations occur in the Fox River drainage and a single population occurs in the Illinois River near Peoria (Fig. 2).

Orconectes rusticus was the most abundant crayfish at almost all of the 37 sites where it was encountered and was the only species collected at 13 of those sites. Most sites not yielding *O. rusticus* were commonly inhabited by *O. propinquus* and *O. virilis*, both wide-ranging and common Illinois species (Page 1985). These two factors strongly suggest that displacement of at least two native Illinois species by *O. rusticus* is occurring. The rapid spread of *O. rusticus* and its ability to displace natives is most apparent in the Rock River where it was collected from six sites between the towns of Byron in Ogle County and Rock Falls in Whiteside County (sites 48 - 52 and 56). The species was the most abundant crayfish collected at sites 48 - 52. At the furthest downstream site (site 56) a single *O. rusticus* was collected among a large population of *O. propinquus*. At site 55, approximately 13 miles downstream of site 56 only *O. propinquus* and *O. virilis* were collected. Page (1985) visited several sites on the Rock River in Ogle County, including our site 51, collecting only *O. propinquus* and *O. virilis*. The displacement of *O. propinquus* and *O. virilis* by *O. rusticus* has been reported by Berrill (1978) and Capelli (1982).

Given the speed at which *O. rusticus* has spread downstream in the Rock River and the abundance of suitable habitat in lower Rock River we believe that in the next ten years the species will invade the remaining lower portions. Likewise, as there is suitable cobble habitat throughout much of the Fox, Kankakee, and Vermilion River drainages, *O. rusticus* will greatly expand its

range in these drainages in this same time period. We speculate that lack of gravel or cobble substrate in areas surrounding the Peoria Lake population has thus far prevented *O. rusticus* from invading new portions of the river.

The mechanisms responsible for *O. rusticus*' ability to successfully invade new areas and displace native crayfish species has received considerable attention (Butler and Stein 1985, Garvey and Stein 1993, Hill and Lodge 1994, Kershner and Lodge 1995). These and other authors implicate *O. rusticus*' aggressive nature and larger body size as factors contributing to its ability to displace other species. The predation rates on these other species are significantly increased as they are forced out of habitat that provides refuge from predation (usually cobble) by the larger and more aggressive *O. rusticus*. The species' ability to occupy several habitat types and a wide range of water depths has likely contributed to its success in Illinois and other states.

We concur with Page (1985) in that the use of *O. rusticus* as fishing bait led to its introduction and initial spread. Examples of bait bucket introductions include the Lake Le-Aqua-Na - Waddams Creek (Stephenson County) and Lake Carlton - Rock Creek (Whiteside County) populations as both are extremely isolated and receive intensive fishing pressure. Current legislation exists that bans the possession and sale of live *O. rusticus* in Illinois; however, the importation of live specimens by at least one Illinois university from biological supply companies is still occurring. Strict enforcement of current Illinois law represents the only available means of slowing the spread of *O. rusticus*. We know of no method to control or limited the spread of the species once it has become established.

ACKNOWLEDGMENTS

We are indebted to Patrick A. Ceas, Kevin S. Cummings, Barbara L. Fuller, Mitchell A. Harris, Steven L. Johnson, Dennis J. Keene, and Brian W. Wilm for field assistance. We are also grateful to Terrence G. Marsh of North Central College, and the DuPage County Forest Preserve

District for depositing their crayfish collections at INHS. Funding for this study was provided by the Wildlife Checkoff Program, Illinois Department of Natural Resources, Division of Natural Heritage.

LITERATURE CITED

Bouchard, R. W. 1977. Threatened and recently extinct crayfishes of the western United States (Decapoda: Astacidae and Cambaridae). Association of Southeastern Biologists Bulletin 24(2): 38-39.

Berrill, M. 1978. Distribution and ecology of crayfish in the Kawartha region of southern Ontario. Canadian Journal of Zoology 56: 166-177.

Butler, M. J., and R. A. Stein. 1985. An analysis of the mechanisms governing species replacements in crayfish. Oecologia 66(2): 168-177.

Capelli, G. M. 1982. Displacement of northern Wisconsin crayfish by *Orconectes rusticus* (Girard). Limnology and Oceanography 27: 741-745.

Capelli, G. M., and Munjal, B. L. 1982. Aggressive interactions and resource competition in relation to species displacement among crayfish of the genus *Orconectes*. Journal of Crustacean Biology 2: 486-492.

Creaser, E. P. 1931. The Michigan decapod crustaceans. Papers of the Michigan Academy of Science, Arts, and Letters 13: 257-276.

Crocker, D. W. 1979. The crayfishes of New England. Proceedings of the Biological Society of Washington 92(2): 225-252.

Crocker, D. W., and Barr, D. W. 1968. Handbook of the crayfishes of Ontario. University of Toronto Press, Toronto, Ontario, Canada.

Garvey, J. E., and R. A. Stein. 1993. Evaluating how chela size influences the invasion potential of an introduced crayfish (*Orconectes rusticus*). American Midland Naturalist 129: 172-181.

Gunderson, J. 1995. Rusty crayfish: a nasty invader. Minnesota Sea Grant, Duluth, Minnesota.

Hagen, H. A. 1870. Monogragh of the North American Astacidae. Illustrated Catalogue of the Museum of Comparative Zoology, Harvard College 3.

Hill, A. M., and D. M. Lodge. 1994. Diel changes in resource demand: competition and predation in species replacement among crayfishes. Ecology 75(7): 2118-2126.

Hobbs III, H. H., and J. P. Jass. 1988. The crayfishes and shrimp of Wisconsin. Milwaukee Public Museum, Milwaukee, Wisconsin.

Hobbs III, H. H., Jass, J. P., and Huner, J. V. 1989. A review of global crayfish introductions with particular emphasis on two North American species (Decapoda, Cambaridae). Crustaceana 56(3): 299-316.

Kershner, M. W., and D. M. Lodge. 1995. Effects of littoral habitat and fish predation on the distribution of an exotic crayfish, *Orconectes rusticus*. Journal of the North American Benthological Society 14(3): 414-422.

Langlois, T. H. 1935. Notes on the habits of the crayfish, *Cambarus rusticus* Girard, in fish ponds in Ohio. American Fisheries Society Transactions 65: 189-192.

Lorman, J. G. 1980. Ecology of the crayfish *Orconectes rusticus* in northern Wisconsin. Ph.D. Dissertation, University of Wisconsin, Madison, Wisconsin.

Page, L. M. 1985. The crayfishes and shrimps (Decapoda) of Illinois. Illinois Natural History Survey Bulletin 33(4): vi + 335-448.

Prins, R. 1968. Comparative ecology of the crayfish *Orconectes rusticus* and *Cambarus tenebrosus* in Doe Run, Meade County, Kentucky. International Revue Gesamten Hydrobiologie 53: 667-714.

Table 1. Population densities and habitat type present at five sites yielding *Orconectes rusticus*.

Site	Number of *O. rusticus* per square meter	Number of individuals of sympatric species per square meter	Habitat
Site # 6 Waddams Cr.	0.4	1.6 - *O. propinquus*	lotic - gravel, cobble substrate
Site # 37 Beaver Cr.	2.6	-	lotic - cobble substrate
Site # 58 Willow Cr.	6.2	0.2 - *C. diogenes*	lotic - fine gravel, cobble substrate
Site # 60 South Fork Kent Cr.	4.2	0.2 - *O. propinquus*	lotic - mud, cobble substrate
Site # 88 Fox R.	1.0	0.1 - *O. propinquus* 0.1 - *O. virilis*	lotic - gravel, cobble substrate

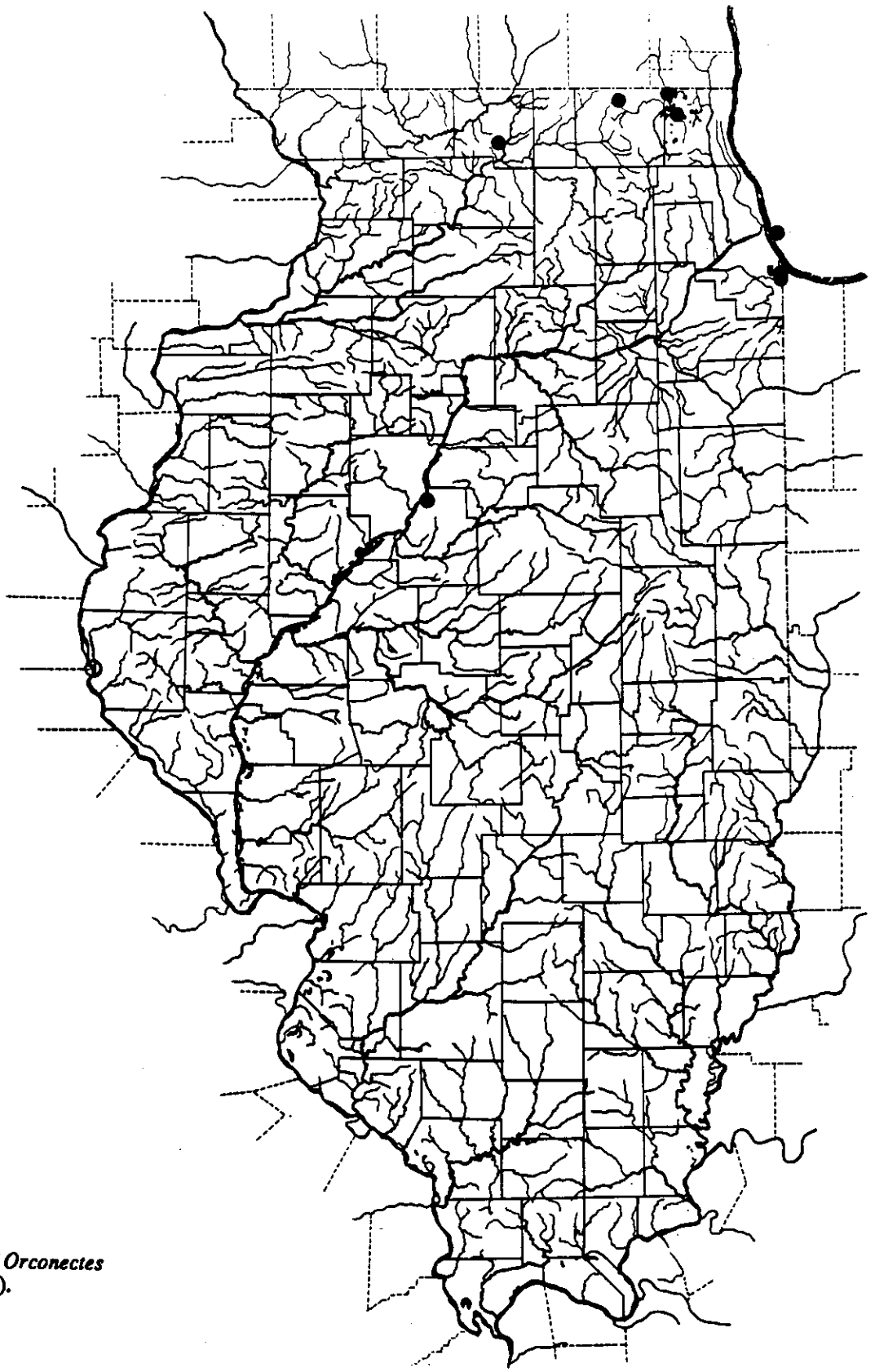

Figure 1. Distribution of *Orconectes rusticus* from Page (1985).

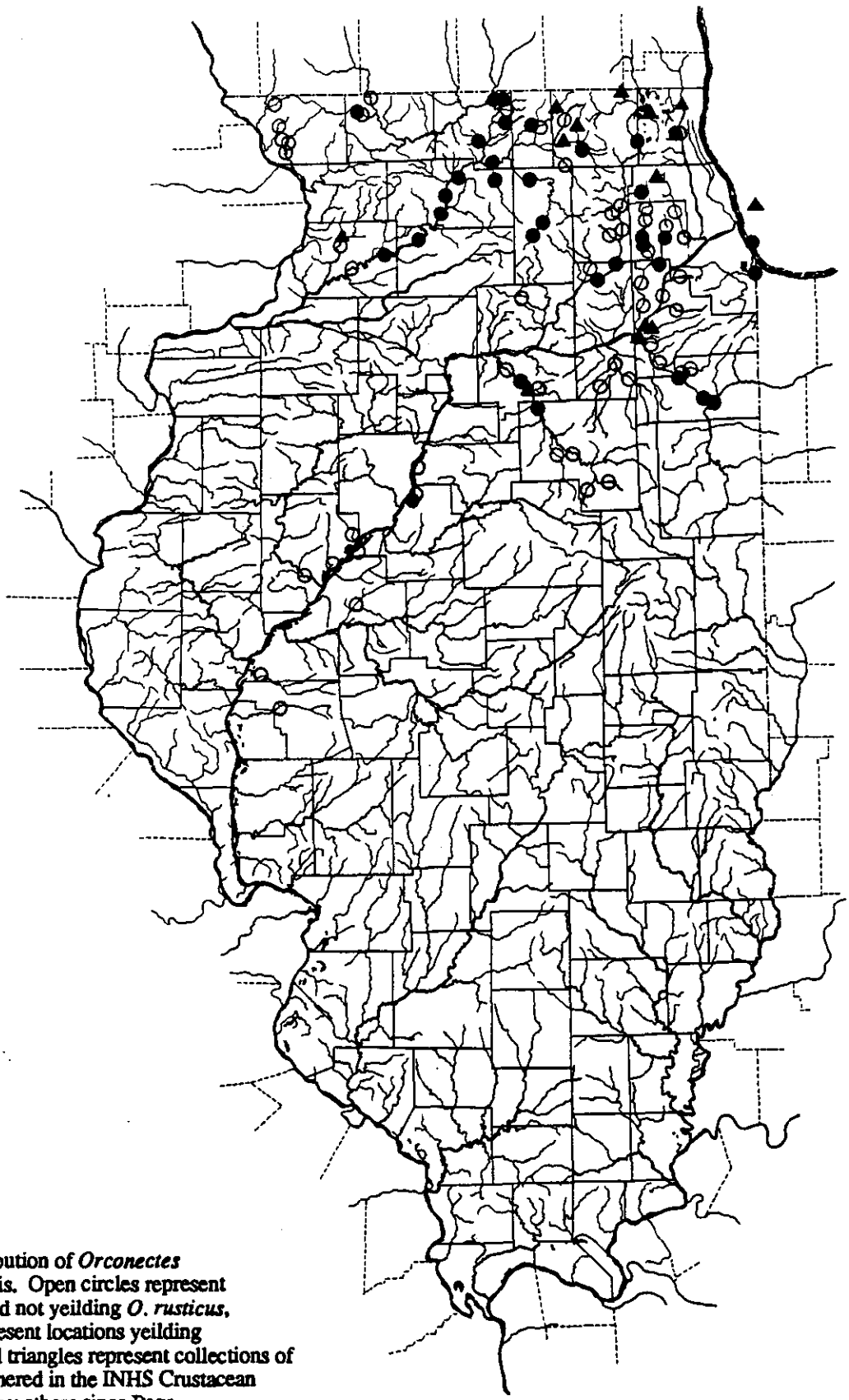

Figure 2. Distribution of *Orconectes rusticus* in Illinois. Open circles represent locations sampled not yeilding *O. rusticus*, solid circles represent locations yeilding *O. rusticus*, solid triangles represent collections of *O. rusticus* vouchered in the INHS Crustacean collection made by others since Page (1985).

Appendix 1. Sites surveyed for the rusty crayfish, *Orconectes rusticus*, in 1994 and 1995. (* indicates sites at which *O. rusicus* was collected)

APPLE RIVER DRAINAGE

Jo Daviess County

1. Apple River 2.5 mi. NNW Hanover; T27N, R2E, Sec. 34, NW1/4. 27 June 1995.
2. Apple River just off Apple River Rd., 1.25 mi. NE Elizabeth; T27N, R3E, Sec. 18, NE1/4. 30 June 1994.
3. Snipe Hollow Creek at Snipe Hollow Rd., 2.5 mi. NW Elizabeth; T27N, R2E, Sec. 11, NW1/4. 27 June 1995.

GALENA RIVER DRAINAGE

Jo Daviess County

4. East Branch Galena River 3 mi. NE Galena; T28N, R1E, Sec. 2, NW1/4. 28 June 1995.

MISSISSIPPI RIVER DRAINAGE

Jo Daviess County

5. Smallpox Creek at North Rawlins Rd., 0.5 mi. NE Guilford; T28N, R2E, Sec. 16, NW1/4. 28 June 1995.

PECATONICA RIVER DRAINAGE

Stephenson County

*6. Waddams Creek at Shippee Rd., 2 mi. N Lena; T28N, R6E, Sec. 21, NE1/4. 28 June 1995.
7. Waddams Creek at Unity Rd., 3.5 mi. NE Lena; T28N, R6E, Sec. 25, NW1/4. 28 June 1995.
8. Pecatonica River at Winslow Rd., 1.5 mi. E Winslow; T29N, R6E, Sec. 24, NW1/4. 28 June 1995.

ILLINOIS RIVER DRAINAGE

Cass County

9. Indian Creek at U.S. Hwy. 67, 5 mi. SW Beardstown; T17N, R12W, Sec. 18, NW1/4. 18 July 1995.

Fulton County

10. Spoon River at U.S. Hwy. 24, just N Duncan Mills; T4N, R3E, Sec. 8, NW1/4. 12 October 1994.
11. Rice Lake at Rice Lake State Fish and Wildlife Area; T6N, R5E, Sec. 28, NW1/4. 12 October 1994.
12. Copperas Creek at U.S. Hwy. 24, at Banner; T6N, R5E, Sec. 11, NE1/4. 12 October 1994.

Morgan County

13. Mauvaise Terre Creek at U.S. Hwy. 67, 4 mi. SSE Concord; T15N, R11W, Sec. 8, NW1/4. 18 July 1995.

Tazewell County

14. Peoria Lake 1.5 mi. N East Peoria; T26N, R4W, Sec. 22, SE1/4. 13 October 1994. 15-16 March 1995.
*15. Peoria Lake 0.5 mi. N East Peoria; T26N, R4W, Sec. 27, SW1/4. 10 August 1995.
16. Upper Peoria Lake at Spring Bay; T27N, R4W, Sec. 2, SE1/4. 13 October 1994. 15-16 March 1995.
17. Spring Lake at Spring Lake State Fish and Wildlife Area; T23N, R7W, Sec. 4, SE1/4. 12 October 1994. 15-16 March 1995

SANGAMON RIVER DRAINAGE

Mason County
18. Crane Creek at Co. Rd. 1200N, 2 mi. W Easton; T21N, R7W, Sec. 27, SW1/4. 12 October 1994.

VERMILION RIVER DRAINAGE

LaSalle County
19. Wolf Creek at IL Hwy. 23, 1 mi. N Streater; T31N, R3E, Sec. 14, NE1/4. 13 June 1995.
20. Vermilion River at Co. Rd. E1500, 1.5 mi. N Kangley; T31N, R3E, Sec. 9, SE1/4. 13 October 1994.
*21. Vermilion River at Co. Rd. N1800, 4 mi. E Leonare; T32N, R3E, Sec. 32, SW 1/4. 13 October 1994.
22. Vermilion River at IL Hwy. 178, 4 mi. NE Tonica; T32N, R2E, Sec. 8, SE1/4. 13 October 1994.

Livingston County
*23. Vermilion River just E Smith Douglas Rd., 2 mi. SSE Streater; T30N, R4E, Sec. 12, NE 1/4. 13 October 1994.
24. Vermilion River at Co. Rd. 1800N, 1 mi. W Pontiac; T28N, R5E, Sec. 17, SE1/4. 6 September 1995.
25. Rooks Creek at IL Hwy. 116, 4 mi. W Pontiac; T28N, R4E, Sec. 26, NE 1/4. 16 March 1995.
26. Indian Creek at Co. Rd. 2075E, 2 mi. SW Fairbury; T26N, R6E, Sec. 16, NE1/4. 16 March 1995.
27. South Fork Vermilion River at Co. Rd. 2800E, 1.5 mi. SE Forrest; T26N, R7E, Sec. 11, NW1/4. 16 March 1995.

KANKAKEE RIVER DRAINAGE

Kankakee County
28. Rock Creek at Co. Rd. 5000W, 2 mi. NNW Altorf; T32N, R11E, Sec. 29, SE 1/4. 18 October 1994.
29. Rock Creek at Kankakee River State Park, 100 m upstream of Kankakee River; T31N, R11E, Sec. 5, NW 1/4. 18 October 1994.
*30. Kankakee River at Aroma Park; T30N, R13W, Sec. 23, NW1/4. 9 August 1994.
*31. Kankakee River at IL Hwy. 17, at Kankakee; T31N, R12E, Sec. 31, SE1/4. 21 June 1994.
*32. Kankakee River and unnamed tributary at Warner Bridge Rd., 2.5 mi. NW Altorf; T32N, R11E, Sec. 31, SW1/4. 13 June 1995.

Will County

33. Forked Creek just N IL Hwy. 102, at Ritchie; T32N, R10E, Sec. 17, NW1/4. 18 October 1994.
34. Prairie Creek at IL Hwy. 102, 3.2 mi. NW Wilmington; T33N, R9E, Sec. 15, NW1/4. 18 October 1994.

MAZON RIVER DRAINAGE

Grundy County
35. Mazon River at Carbon Hill Rd., 2 mi. N Gardner; T32N, R8E, Sec. 27, SW1/4. 13 June 1995.
36. Mazon River at IL Hwy 113, 3.5 mi. W Coal City; T32N, R8E, Sec. 6, NW1/4. 30 August 1995.
37. West Branch Mazon River at Holm Rd., 4.5 mi. SE Verona; T31N, R7E, Sec. 8, SW1/4. 13 June 1995.

KISHWAUKEE RIVER DRAINAGE

Boone County
38. Piscasaw Creek at Denny Rd., 4 mi. SW Capron; T45N, R4E, Sec. 27, SW 1/4. 2 May 1995.
*39. Beaver Creek at Edson Rd., 1 mi. SE Poplar Grove; T45N, R4E, Sec. 30, NE 1/4. 2 May 1995.

Dekalb County
*40. South Branch Kishwaukee River at Fairview Dr., 1 mi. S Dekalb; T40N, R4E, Sec. 34, NW1/4. 7 June 1995.
*41. South Branch Kishwaukee River at Minnegan Rd., 5.5 mi. NW Waterman; T39N, R3E, Sec. 25, NE1/4. 7 June 1995.
*42. South Branch Kishwaukee River at Pearl St., at N edge Kirkland; T42N, R3E, Sec. 24, SW1/4. 11 July 1995.

McHenry County
43. Coon Creek at Coon Creek Rd., 6 mi. S Marengo; T43N, R5E, Sec. 35, NE 1/4. 2 May 1995.
*44. South Branch Kishwaukee River at North Union Rd., 1 mi. N Union; T44N, R6E, Sec. 33, NW 1/4. 2 May 1995.
45. Rush Creek at U.S. Hwy. 14, 1 mi. S Harvard; T45N, R5E, Sec. 11, NE 1/4. 2 May 1995.

Ogle County
*46. Kilbuck Creek at IL Hwy. 72, 2.25 mi. E Davis Junction; T42N, R2E, Sec. 19, NW1/4. 11 July 1995.

Winnebago County
*47. Kishwaukee River at IL Hwy. 251, at New Milford; T43N, R1E, Sec. 24, SW1/4. 11 July 1995.

ROCK RIVER DRAINAGE

Lee County
*48. Rock River 0.5 mi. downstream Galena Ave., at Dixon; T22N, R9E, Sec. 32, SW1/4. 12 July 1995.

Ogle County

*49. Rock River at Byron boat ramp; T25N, R11E, Sec. 32, SW1/4. 11 July 1995.
*50. Rock River just above IL Hwy. 64, at Oregon; T23N, R10E, Sec. 3, NE1/4. 11 July 1995.
*51. Rock River at Castle Rock State Park, 3 mi. W Daysville; T23N, R10E, Sec. 17, SE1/4. 12 July 1995.
*52. Rock River 2 mi. S Oregon; T23N, R10E, Sec. 15, SW1/4. 12 July 1995.

Whiteside County
53. Rock Creek at Damen Rd., 0.5 mi. N Morrison; T21N, R5E, Sec. 7, SE1/4. 12 July 1995.
54. Rock River at Oppald Marina, at Sterling; T21N, R7E, Sec. 25, NE1/4. 12 July 1995.
55. Rock River at Lyndon; T20N, R5E, Sec. 21, NE1/4. 6 September 1995.
*56. Rock River at Rock Falls, just below dam; T21N, R7E, Sec. 28, NE1/4. 6 September 1995.

Winnebago County
*57. Dry Creek at jct. of Willowbrook and Prairie Hill Rds., 2 mi. SE South Beloit; T46N, R2W, Sec. 9, SE1/4. 31 May 1995.
58. South Kinnikinnick Creek at Hamborg Rd., 1.5 mi. E Roscoe; T46N, R2E, Sec. 35, SW1/4. 31 May 1995.
*59. Pearl Lake at South Beloit; T46N, R2E, Sec. 8, NE1/4. 31 May 1995.
*60. Willow Creek at Rock Cut State Park, just above Pierce Lake; T45N, R2E, Sec. 26, NE1/4. 31 May 1995.
*61. North Fork Kent Creek at West Riverside Blvd., at Anna R. Page Conservation Forest; T44N, R1E, Sec. 8, NE1/4. 31 May 1995.
*62. South Fork Kent Creek at Centerville Rd., at SW edge Rockford; T44N, R1E, Sec. 30, SE1/4. 31 May 1995.

DES PLAINES RIVER DRAINAGE

Cook County
63. Long Run at State St., 1.5 mi. S Lemont; T37N, R11E, Sec. 32, SE1/4. 6 June 1995.

DuPage County
64. Salt Creek at York Rd., in Oakbrook; T39N, R11E, Sec. 36, SE1/4. 2 August 1995.
65. Salt Creek at Salt Creek Forest Preserve, 0.8 mi. S IL Hwy. 19; T40N, R11E, Sec. 16, SE1/4. 2 August 1995.

Lake County
*66. Bull Creek at IL Hwy. 21, 1 mi. N Libertyville; T44N, R11E, Sec. 8, NE1/4. 3 May 1995.
*67. Unnamed tributary of Des Plaines River at IL Hwy. 21, 0.1 mi. S Casey Rd.; T44N, R11E, Sec. 4, SW1/4. 3 May 1995.
68. Unnamed tributary of Des Plaines River at jct. of IL Hwy. 21 and 120; T45N, R11E, Sec. 27, SW1/4. 3 May 1995.
69. Unnamed tributary of Des Plaines River at IL Hwy. 137, 1 mi. E Libertyville; T44N, R11E, Sec. 10, NW1/4. 3 May 1995.

Will County
70. Hickory Creek at Gouger Rd., 1 mi. E Ridgewood; T35N, R11E, Sec. 7, SE1/4. 6 June 1995.

71. Des Plaines River at IL Hwy. 7, at Lockport; T36N, R10E, Sec. 22, NE1/4. 6 June 1995.

DUPAGE RIVER DRAINAGE

DuPage County

72. East Branch DuPage River at Churchill Forest Preserve, at Crescent Blvd. spillway; T39N, R10E, Sec. 12, NE1/4. 17 July 1995.
*73. East Branch DuPage River at Hidden Lake Forest Preserve, 0.25 mi. downstream IL Hwy. 56; T39N, R10E, Sec. 36, NW1/4. 18 July 1995.
74. West Branch DuPage River 0.5 mi. N Hobson Rd., at Naperville; T38N, R10E, Sec. 30, NE1/4. 6 June 1995.
75. West Branch DuPage River at Washington Rd., at Naperville; T37N, R10E, Sec. 6, NE1/4. 6 June 1995.
76. West Branch DuPage River at Army Trail Rd., 3.5 mi. N West Chicago; T40N, R9E, Sec. 23, NW1/4. 8 July 1995.
77. West Branch DuPage River at West DuPage Park, at West Chicago; T39N, R9E, Sec. 11, SW1/4. 8 July 1995.
*78. West Branch DuPage River at Mack Rd., 1 mi. S West Chicago; T39N, R9E, Sec. 22, SW1/4. 8 July 1995.
*79. West Branch DuPage River at Warrenville Grove Forest Preserve, at Warrenville; T39N, R9E, Sec. 35, NE1/4. 10 July 1995.

Will County

*80. East Branch DuPage River at Naperville Rd., 1 mi. S Naperville; T37N, R10E, Sec. 7, NE1/4. 6 June 1995.
81. DuPage River at Pilcher Rd., 2 mi. N Plainfield; T36N, R9E, Sec. 3, NE1/4. 6 June 1995.
82. DuPage River at Shorewood dam, just N Hwy 52; T35N, R9E, Sec. 10, SW1/4. 28 August 1995.

FOX RIVER DRAINAGE

Cook County

*83. Poplar Creek at Bode Lake spillway, 1 mi. N Streamwood; T41N, R9E, Sec. 14, NE1/4. 13 July 1995.

Kane County

84. Ferson Creek at Randall Rd., 1.5 mi. NNW St. Charles; T40N, R8E, Sec. 20, SE1/4. 7 June 1995.
85. Mill Creek at Main St., 1 mi. W Batavia; T39N, R8E, Sec. 20, NW1/4. 7June 1995.
86. Fox River at old R.R. bridge, 1 mi. S South Elgin; T40N, R8E, Sec. 2, SW1/4. 16 August 1994.
87. Fox River at IL Hwy. 38, at Geneva; T39N, R8E, Sec. 3, SE1/4. 8 July 1995.

Kendall County

88. Big Rock Creek at Galena Rd., 4 mi. NE Plano; T37N, R6E, Sec. 1, NE1/4. 7 June 1995.
*89. Fox River 1 mi. S Montgomery; T38N, R8E, Sec. 5, SW1/4. 22 August 1995.
*90. Fox River at Yorkville boat ramp; T37N, R7E, Sec. 32, NE1/4. 28 August 1995.

LaSalle County

91. Indian Creek at U.S. Hwy 34, 0.25 mi. S Earlville; T36N, R3E, Sec. 19, NE1/4. 7 June 1995.

McHenry County

*92. Cotton Creek at IL Hwy. 176, just below Island Lake spillway; T44N, R9E, Sec. 20, SE1/4. 8 July 1995.

LAKE MICHIGAN DRAINAGE

*93. Wolf Lake at William W. Powers Conservation Area, just E Hegewisch; T37N, R15E, Sec. 29, SW1/4. 15 August 1995.

*94. Lake Michigan at Jackson Park, Chicago; T38N, R14E, Sec. 24, SE1/4. 15 August 1995.