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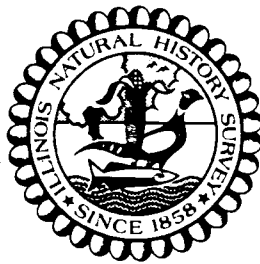
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ILLINOIS NATURAL HISTORY SURVEY

SURVEY OF KANKAKEE RIVER FISHES AND MUSSELS AT ILLINOIS ROUTE 53 BRIDGE
IN WILMINGTON, WILL COUNTY, ILLINOIS
IDOT JOB NUMBER P-91-051-79

FINAL REPORT

20 June 1985



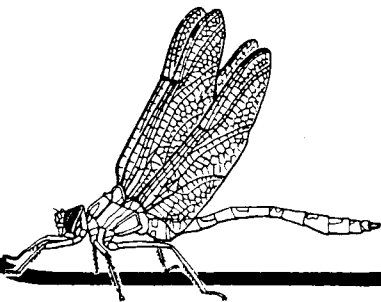
Section of Faunistic Surveys and Insect Identification Technical Report

by

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Section of Faunistic Surveys and Insect Identification
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TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
DESCRIPTION OF STUDY AREA	1
FISH SURVEY	3
Methods	3
Results	3
Discussion	3
LIFE HISTORY ACCOUNTS OF THREATENED ILLINOIS FISHES FOUND IN THE KANKAKEE RIVER SYSTEM	9
MUSSEL SURVEY	12
Methods	12
Results	12
Discussion	16
PRESENT STATUS OF MUSSELS IN THE KANKAKEE RIVER	17
HISTORICAL ACCOUNTS OF MUSSELS FOUND IN THE KANKAKEE RIVER SYSTEM	18
ACKNOWLEDGEMENTS	20
LITERATURE CITED	21

INTRODUCTION

The Kankakee River has long been recognized as one of the highest-quality streams in Illinois (Ivens *et al.* 1981). Surveys on fishes of the Kankakee River have been conducted intermittently since 1895 (Forbes and Richardson 1908; Illinois Department of Conservation 1964; Larimore 1978; Page *et al.* [1979]; Smith 1979; Skelly and Sule 1980; Brigham *et al.* 1981; and Wetzel *et al.* 1984a). It supports a large and diverse mussel population which has been studied for nearly 100 years (Baker 1906; Wilson and Clark 1912; Parmalee 1967; Brice and Lewis 1979; Lewis and Brice 1980; Page *et al.* [1979]; Brigham, Suloway, and Page 1981; Suloway 1981; Brigham *et al.* 1984, Wetzel *et al.* 1984a; and Wetzel, Kasprowicz, and Brigham 1984b).

In addition, one species of fish known to occur in the Kankakee River - the blacknose shiner (*Notropis heterolepis* Eigenmann and Eigenmann) - is a state threatened species (Smith and Page 1981). The pallid shiner (*Notropis amnis* Hubbs and Greene), a fish previously thought to be extirpated from Illinois, but recently discovered in the Kankakee River (Skelly and Sule 1983), has been proposed for listing as a state threatened species (Sweet 1984).

The Illinois Department of Transportation (IDOT), Bureau of Location and Environment, is required to comply with Section 404(b)1 of the Clean Water Act when projects have the potential to impact on aquatic environments. In addition, IDOT also is required by Section 7 of the Endangered Species Act of 1973, as amended, to conduct a biological inventory for the purpose of identifying federally listed endangered and threatened species likely to be affected by its highway construction projects. IDOT also wishes to consider in a similar fashion those species listed as endangered or threatened in Illinois by the state Endangered Species Protection Board. In many cases, the general distribution patterns of these species are known, but specific records from the project area are not available. Usually a field reconnaissance and review of appropriate publications and museum records are necessary to determine whether or not a species actually occurs or is likely to occur in a project area.

In conjunction with the proposed IDOT project (Job Number P-91-051-79) in which the Illinois Route 53 bridge crossing the Kankakee River in Wilmington, Will County, Illinois will be removed and replaced, the Illinois Natural History Survey conducted such an inventory to determine the actual or likely occurrence of fish and mussel species within the project area. Particular attention was given to federal and state endangered and threatened species, which, based upon past records and information about habitat preferences, were known or thought likely to occur in the Kankakee River.

DESCRIPTION OF STUDY AREA

The Illinois Route 53 bridge across the Kankakee River is located in the City of Wilmington in Will County, Illinois (Figure 1). The legal description of the study area, taken from a U. S. Geological Survey topographic quadrangle map, is as follows:

IL, Will County, Kankakee River, in Wilmington, along the W edge of Wilmington Island Park. T.33 N, R.9 E, SW/4, SW/4, SW/4, Sec. 25, and SE/4, SE/4, SE/4, Sec. 26. U.T.M.: 4573100m N., 403600m E., Zone 16. Wilmington, Ill. (7.5' series, 1954 ed., 1973PR) USGS quadrangle map.

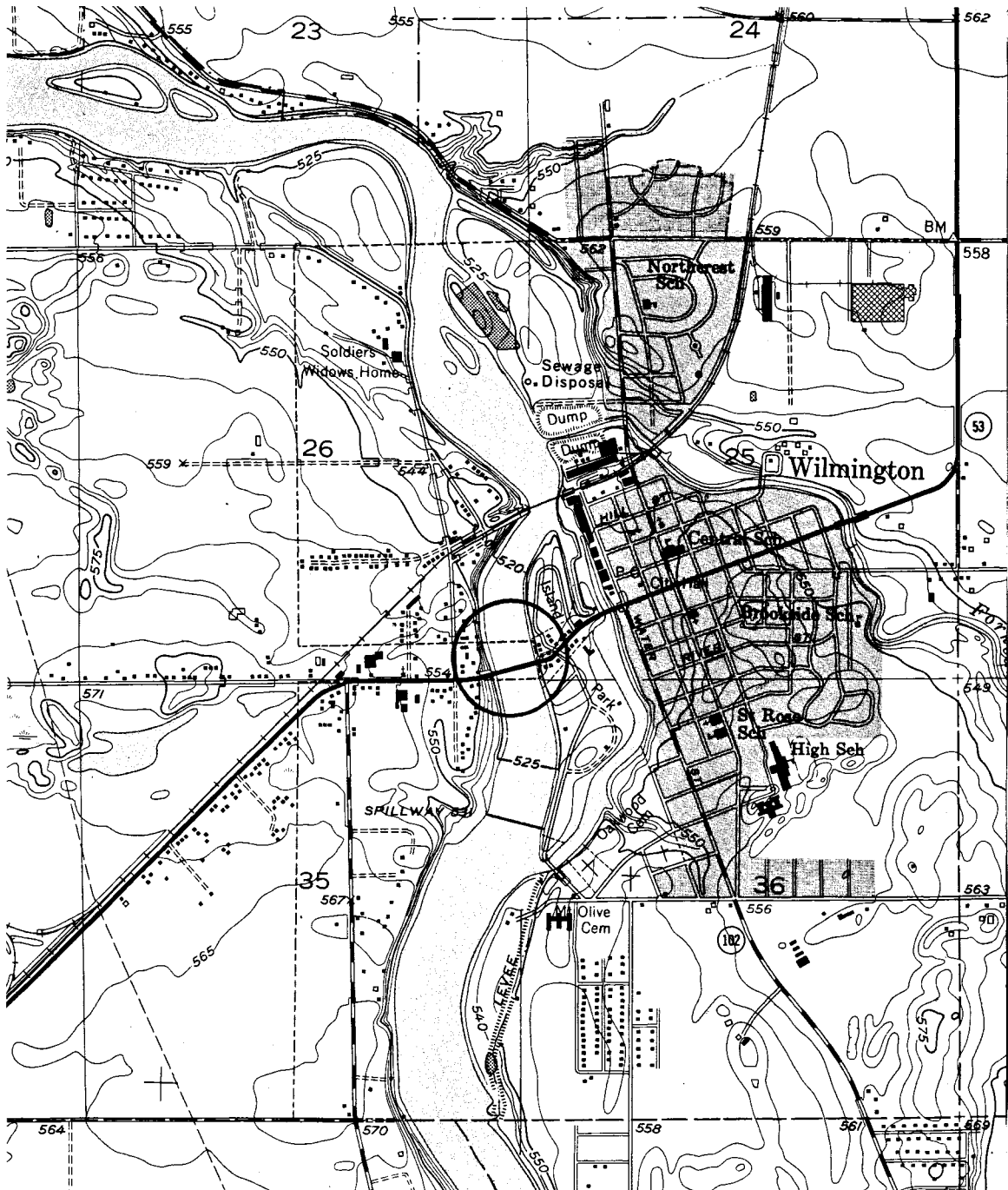


Figure 1. Location of study site discussed in *Survey of Kankakee River fishes and mussels at Illinois Route 53 bridge in Wilmington, Will County, Illinois*. IDOT Job Number P-91-051-79. (Taken from the Wilmington, Ill. (7.5' series, 1954 ed., 1973PR) USGS quadrangle map).

FISH SURVEY

Methods

Fishes were sampled using a 4'x10'x1/8" common minnow seine. Fifteen seine hauls were taken from within the study area (Figure 2). Habitats sampled included pools, riffles, and raceways. Sand and silt substrates predominated in pools and backwater areas while gravel, rocks, and bedrock were most common in raceways and riffles. Fish collections were made on 7 September 1984 under the supervision of INHS ichthyologist Kevin S. Cummings, with the assistance of INHS biologist Pat J. McKenna.

Results

A total of 15 species was collected from this site, representing five families and eight genera (Table 1). Minnows accounted for 60% of the species taken, with spotfin shiners (*Notropis spilopterus* (Cope)), bullhead minnows (*Pimephales vigilax* (Girard)), and bluntnose minnows (*Pimephales notatus* Rafinesque) accounting for 124 of the 210 specimens collected.

Eighty-six species of fishes have been collected in the Kankakee River in recent times (Page *et al.* [1979]). Because of habitat preference, some fishes are found only in the headwaters while others only downstream. The combination of low water level, available habitat, and selective collecting apparatus probably accounted for the smaller number of species collected in 1984.

Discussion

Of all the fishes known to occur in the Kankakee River (Table 2), only one, the blacknose shiner (*Notropis heterolepis* Eigenmann & Eigenmann), is listed as threatened in the State of Illinois (Smith and Page 1981). However, the blacknose shiner is restricted primarily to tributaries of the Kankakee River and is seldom found in the river mainstream.

Another species known to occur in the Kankakee River and of special concern is the pallid shiner (*Notropis amnis* Hubbs & Greene). This species, once thought to have been extirpated from Illinois, was collected in 1978, 1979, 1981, and 1982 from the Kankakee River near Custer Park (Skelly and Sule 1983). Because of its presence in the Kankakee River, the pallid shiner currently is under consideration for the Illinois list of threatened species (Sweet 1984). This species lives in quiet silt- and sand-bottomed pools of large rivers. The population remaining in the Kankakee River persists because of high water quality and suitable habitat.

Life history accounts of the blacknose shiner and the pallid shiner are included below.

None of the fishes known to occur in the Kankakee River are listed as federally endangered, nor are any currently under consideration for such listing (U.S. Department of the Interior, Fish and Wildlife Service [USDI] 1982).

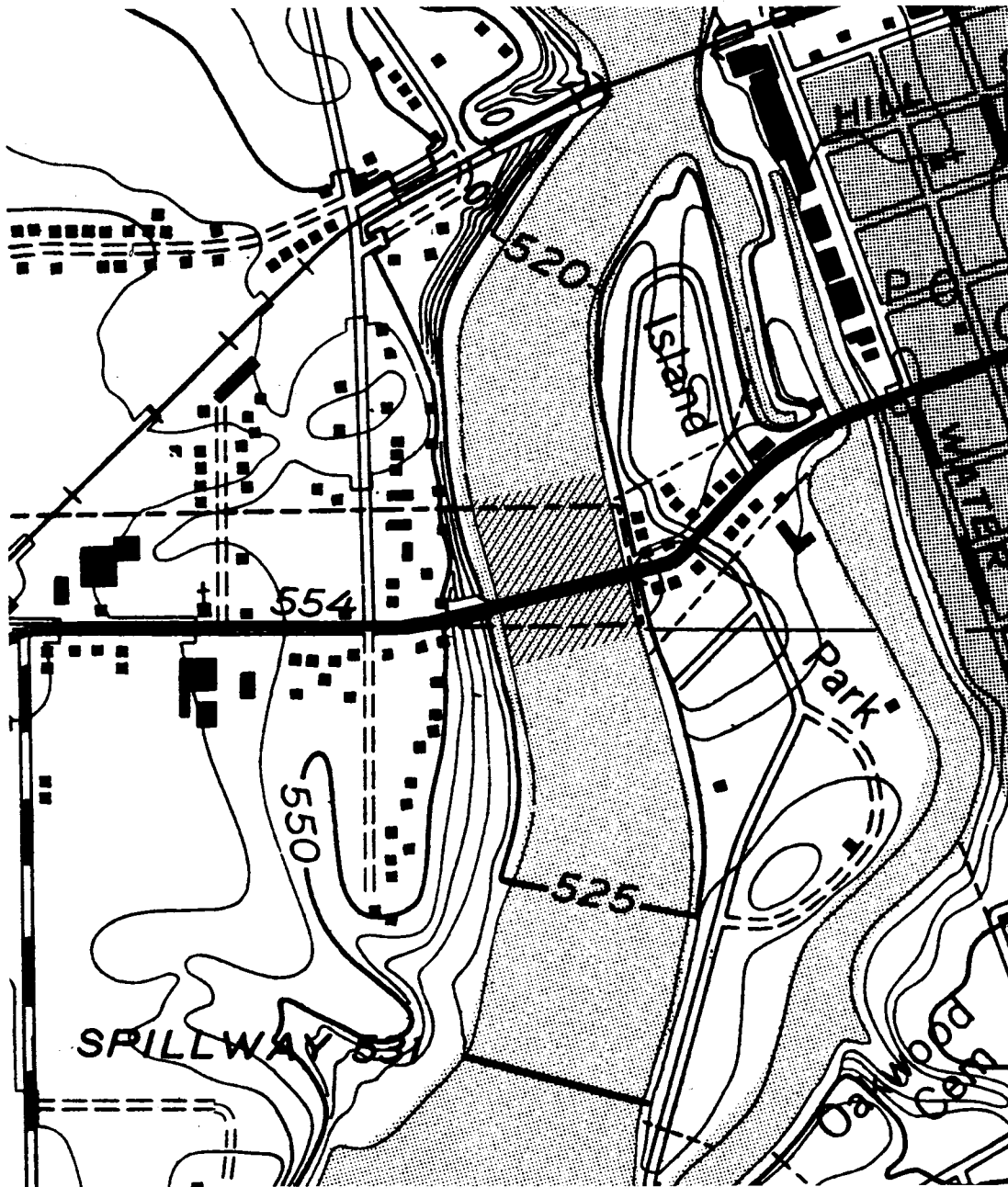


Figure 2. Crosshatched area represents the reach of the Kankakee River immediately upstream and downstream of the Illinois Route 53 bridge in Wilmington, Will County, Illinois, sampled for fishes on 7 September 1984 (Taken from the Wilmington, Ill. (7.5' series, 1954 ed., 1973PR) USGS quadrangle map).

Table 1. List of fishes collected 7 September 1984 from the Kankakee River at the Illinois Route 53 bridge in Wilmington, Will Co., Illinois.

Family Cyprinidae - carps and minnows	<u>Number Collected</u>
<i>Nocomis biguttatus</i> (Kirtland)	9
<i>Notropis atherinoides</i> Rafinesque	19
<i>Notropis chrysocephalus</i> (Rafinesque)	6
<i>Notropis lutrensis</i> (Baird & Girard)	2
<i>Notropis rubellus</i> (Agassiz)	12
<i>Notropis spilopterus</i> (Cope)	82
<i>Notropis stramineus</i> (Cope)	9
<i>Pimephales notatus</i> (Rafinesque)	25
<i>Pimephales vigilax</i> (Baird & Girard)	27
Family Ictaluridae - bullhead catfishes	
<i>Noturus flavus</i> Rafinesque	2
Family Atherinidae - silversides	
<i>Labidesthes sicculus</i> (Cope)	4
Family Centrarchidae - sunfishes	
<i>Lepomis megalotis</i> (Rafinesque)	10
<i>Micropterus dolomieu</i> Lacepede	1
Family Percidae - perches	
<i>Etheostoma nigrum</i> Rafinesque	1
<i>Etheostoma zonale</i> (Cope)	1
Total	210

Table 2. List of fishes known to occur in the Kankakee River, Illinois.
 (Sources: Illinois Department of Conservation, Illinois Natural
 History Survey, Page *et al.* [1979], Brigham *et al.* 1981).

FAMILY	SCIENTIFIC NAME	COMMON NAME
PETROMYZONTIDAE lampreys	<i>Ichthyomyzon fossor</i> <i>I. unicuspis</i> <i>Lamproetra appendix</i>	northern brook lamprey silver lamprey American brook lamprey
LEPISOSTEIDAE gars	<i>Lepisosteus osseus</i>	longnose gar
AMIIDAE bowfins	<i>Amia calva</i>	bowfin
ANGUILLIDAE freshwater eels	<i>Anguilla rostrata</i>	American eel
HIODONTIDAE mooneyes	<i>Hiodon alosoides</i>	goldeye
CLUPEIDAE herrings	<i>Alosa chrysochloris</i> <i>Dorosoma cepedianum</i>	skipjack herring gizzard shad
SALMONIDAE trouts	<i>Salmo gairdneri</i>	rainbow trout
UMBRIDAE mudminnows	<i>Umbra limi</i>	central mudminnow
ESOCIDAE pikes	<i>Esox americanus</i> <i>E. lucius</i> <i>E. masquinongy</i>	grass pickerel northern pike muskellunge
CYPRINIDAE carps & minnows	<i>Campostoma anomalum</i> <i>Carassius auratus</i> <i>Cyprinus carpio</i> <i>Ericymba buccata</i> <i>Nocomis biguttatus</i> <i>Notemigonus crysoleucas</i> <i>Notropis amnis</i> <i>N. atherinoides</i> <i>N. buechanani</i> <i>N. chalybaeus</i> <i>N. chrysocephalus</i> <i>N. cornutus</i> <i>N. dorsalis</i> <i>N. emiliae</i> <i>N. heterolepis</i>	central stoneroller goldfish common carp silverjaw minnow hornyhead chub golden shiner pallid shiner emerald shiner ghost shiner ironcolor shiner striped shiner common shiner bigmouth shiner pugnose minnow blacknose shiner

Table 2. Continued.

FAMILY	SCIENTIFIC NAME	COMMON NAME
CYPRINIDAE (cont'd)	<i>N. lutrensis</i>	red shiner
	<i>N. rubellus</i>	rosyface shiner
	<i>N. spilopterus</i>	spotfin shiner
	<i>N. stramineus</i>	sand shiner
	<i>N. texanus</i>	weed shiner
	<i>N. umbratilis</i>	redfin shiner
	<i>N. volucellus</i>	mimic shiner
	<i>Phenacobius mirabilis</i>	suckermouth minnow
	<i>Pimephales notatus</i>	bluntnose minnow
	<i>P. promelas</i>	fathead minnow
	<i>P. vigilax</i>	bullhead minnow
	<i>Semotilus atromaculatus</i>	creek chub
	<i>Cyprinus carpio</i> x <i>Carassius auratus</i>	hybrid
	CATOSTOMIDAE suckers	<i>Carpiodes carpio</i>
<i>C. cyprinus</i>		quillback
<i>Catostomus commersoni</i>		white sucker
<i>Erimyzon sucetta</i>		lake chubsucker
<i>Hypentelium nigricans</i>		northern hog sucker
<i>Ictiobus bubalus</i>		smallmouth buffalo
<i>I. cyprinellus</i>		bigmouth buffalo
<i>I. niger</i>		black buffalo
<i>Minytrema melanops</i>		spotted sucker
<i>Moxostoma anisurum</i>		silver redhorse
<i>M. carinatum</i>		river redhorse
<i>M. erythrum</i>	golden redhorse	
<i>M. macrolepidotum</i>	shorthead redhorse	
ICTALURIDAE bullhead catfishes	<i>Ictalurus melas</i>	black bullhead
	<i>I. natalis</i>	yellow bullhead
	<i>I. punctatus</i>	channel catfish
	<i>Noturus flavus</i>	stonecat
	<i>Pylodictis olivaris</i>	flathead catfish
CYPRINODONTIDAE killifishes	<i>Fundulus notti</i>	starhead topminnow
	<i>F. notatus</i>	blackstripe topminnow
ATHERINIDAE silversides	<i>Labidesthes sicculus</i>	brook silversides
APHREDODERIDAE pirate perches	<i>Aphredoderus sayanus</i>	pirate perch

Table 2. Concluded.

FAMILY	SCIENTIFIC NAME	COMMON NAME
CENTRARCHIDAE sunfishes	<i>Ambloplites rupestris</i>	rock bass
	<i>Lepomis cyanellus</i>	green sunfish
	<i>L. gibbosus</i>	pumpkinseed
	<i>L. gulosus</i>	warmouth
	<i>L. humilis</i>	orangespotted sunfish
	<i>L. macrochirus</i>	bluegill
	<i>L. megalotis</i>	longear sunfish
	<i>L. microlophus</i>	redeer sunfish
	<i>Micropterus dolomieu</i>	smallmouth bass
	<i>M. salmoides</i>	largemouth bass
	<i>Pomoxis annularis</i>	white crappie
	<i>P. nigromaculatus</i>	black crappie
	<i>Lepomis megalotis</i> x	hybrid
	PERCIDAE perches	<i>Etheostoma caeruleum</i>
<i>E. chlorosomum</i>		bluntnose darter
<i>E. flabellare</i>		fantail darter
<i>E. microperca</i>		least darter
<i>E. nigrum</i>		johnny darter
<i>E. zonale</i>		banded darter
<i>Perca flavescens</i>		yellow perch
<i>Percina caprodes</i>		logperch
<i>P. maculata</i>		blackside darter
<i>P. phoxocephala</i>		slenderhead darter
<i>Stizostedion vitreum</i>	walleye	

LIFE HISTORY ACCOUNTS OF THREATENED ILLINOIS FISHES
FOUND IN THE KANKAKEE RIVER SYSTEM

Notropis heterolepis Eigenmann & Eigenmann - Blacknose shiner

The blacknose shiner is a northern minnow, ranging from Saskatchewan to Nova Scotia, but persisting in disjunct relict populations as far south as Illinois, Indiana, Missouri, and Ohio. Cross (1967) suggested that this species was extirpated recently from Kansas. Formerly, this species was found throughout the northern two-thirds of Illinois, and in Clear Creek, Union County (Forbes and Richardson 1920). Presently, however, the blacknose shiner is known only from glacial lakes and tributaries of the Fox River in Lake and McHenry counties, the Kankakee River drainage in Iroquois, Kankakee, and Will counties, from Fairfield Ditch, Green River drainage in Bureau County, the Kishwaukee River in Boone and McHenry counties, and from Coon Creek in Whiteside County (Smith 1979; Smith and Page 1981).

No comprehensive systematic review of *Notropis heterolepis* has been done (Gilbert 1980). Presently, only the nominate subspecies, *N. heterolepis heterolepis* is known to occur in Illinois (see Scott and Crossman 1973, and Smith 1979 for additional information).

The blacknose shiner is known to occur in cool, clear, densely vegetated waters (Gilbert 1980; Smith 1979; Becker 1983), including lakes and streams (Smith and Page 1981).

Although no detailed information on the food habits of the blacknose shiner have been published, insect larvae and entomostracans have been found to form a large part of the diet (Cahn 1927; Becker 1983). In Minnesota, algae, sponges, and larval and adult insects were the principal food items found (Nurnberger 1928). However, the ventral position of the mouth and short intestine suggests that this species may be a carnivorous benthic feeder (Becker 1983).

While factors limiting reproduction are unknown, the blacknose shiner appears to be extremely intolerant of siltation and turbidity (Trautman 1957; Scott and Crossman 1973; Smith 1979; Smith and Page 1981; Becker 1983). Breeding season in Illinois is from June to August (Forbes and Richardson 1920; Smith 1979). Spawning behavior and habits are unknown, but it has been suggested that spawning occurs over sandy areas (Scott and Crossman 1973; Becker 1983). Lopinot and Smith (1973) reported that this species reaches sexual maturity and spawns at 1 year of age.

Reason for threatened status in Illinois: The disappearance of the blacknose shiner in Illinois has been among the most dramatic of any fish (Smith and Page 1981, and elsewhere). The blacknose shiner is no longer present in many localities in which it formerly occurred (Trautman 1957; Scott and Crossman 1973; Gilbert 1980; Smith 1979; Smith and Page 1981; Becker 1983). Increased siltation, turbidity, and the disappearance of aquatic vegetation are probably the major factors causing its decline in Illinois (Smith 1979). These factors have been shown to be responsible for the decline of this species in Ohio (Trautman 1957), and in Missouri (Pflieger 1975).

Notropis amnis Hubbs & Green - Pallid shiner

The pallid shiner, *Notropis amnis* Hubbs and Greene, is one of the rarest and least known American fishes (Smith 1979). Its range extends from the Mississippi River in Minnesota and Wisconsin south to the Amite River in Louisiana and west to the Guadalupe River in Texas (Clemmer 1980). This fish is rare in the northern half of its range; since 1970 most specimens have been taken from backwaters of the Mississippi River in Wisconsin, primarily between the Wisconsin-Illinois border and Prairie du Chien (Don Fago, Wisconsin Department of Natural Resources, pers. comm. to Skelly and Sule 1983). This species has shown the most marked decline of any fish in Missouri and may be extirpated from that state (Pfleiger 1975). It was thought to be extirpated from Illinois until its recent collection in the Kankakee River. Since 1978, Illinois Natural History Survey biologists have collected 18 specimens, 15 in August collections and 3 in November. Prior to these collections only 22 specimens of *N. amnis* were considered Illinois records, the last collected in 1963 (Skelly and Sule 1983).

Notropis amnis from the Kankakee River was found in areas of slight current, no measurable current, and backflow. Although turbidities during collecting periods were low, the river is subject to dramatic increases in turbidity (as high as 300 NTU) during storm periods. All *N. amnis* were collected in seizable areas at water depths no greater than 1.5 m. Water temperatures varied seasonally, with specimens collected in water 6.0°C to 29.5°C. These quantitative data supplement earlier observations, such as turbidity ranging from "clear" to "very muddy" (Hubbs 1951), and that *N. amnis* is somewhat tolerant of turbidity (Clay 1975). Pflieger (1975) stated that this species is intolerant of excessive siltation and turbidity. Several studies have shown that *N. amnis* resides in slowly moving waters (Hubbs 1951; Miller and Robison 1973; Clay 1975; and Pflieger 1975). When collected from the Mississippi River, it has been collected in flowing water over sand bars (Harlan and Speaker 1969; Eddy and Underhill 1974).

Most of the specimens of *Notropis amnis* collected by Skelly and Sule (1983), were taken from an area between 200 and 750 m downstream of the confluence of Horse Creek with the Kankakee River near Custer Park. Unlike other stations within their study area that were periodically scoured by currents, this area remained a slack-water, depositional area despite fluctuating levels of river discharge. Year-round slow current and depositional substrate appear to be the preferred habitat of *N. amnis*, since no specimens were collected by Skelly and Sule in any other habitat type despite extensive sampling throughout the monitoring area.

Good water quality throughout their study area, as indicated by the analysis of 54 water quality parameters (Skelly and Sule 1980), and a variety of habitats are important to the maintenance of the diverse Kankakee River assemblage of fishes, totaling at least 86 species. The Kankakee River in Illinois is noted for its good water quality, diverse aquatic life, and scenic beauty (Ivens *et al.* 1981).

Notropis amnis seldom enters the mouths of tributary streams (Hubbs 1951; Eddy and Underhill 1974). The lentic characteristics within the mouth of Horse Creek, a third order stream (Horton-Strahler system) entering the Kankakee River within the study area of Skelly and Sule (1983), were quite similar to those found between its mouth and 750 m downstream of its confluence, yet no pallid shiners were collected from that creek. Hubbs (1951) suggested that *N. amnis* in its northern range is confined to the large lowland rivers, possibly because large rivers are warmer than small- to medium-sized streams. Small streams like Horse Creek are also subject to sudden increases in current that may be unacceptable to *N. amnis*.

Thirty-six species representing 8 families of fishes were collected by Skelly and Sule (1983) at stations where *N. amnis* was collected. Species and abundance of fishes collected varied by date and station. However, the most common associations and those found during each sampling period included *Notropis spilopterus* and *Pimephales notatus*. *Pimephales vigilax* and *Notropis stramineus* were abundant during several collections, and *Lepomis humilis* was occasionally common. *Notropis spilopterus* is the only member of this group that is considered characteristic of high-gradient streams. The other species are characteristic of quiet pools and backwaters of medium to moderately large streams. Both *N. spilopterus* and *L. humilis* are somewhat tolerant of turbid conditions (Pflieger 1975).

Notropis amnis has not been listed officially as endangered or threatened in Illinois because it was believed to have been extirpated. This species, now known to exist in Illinois waters, has been proposed by the Illinois Endangered Species Technical Advisory Committee on Fishes for consideration as a threatened species. Additional studies, especially on the Mississippi and Kankakee rivers, are critical if the exact status of this fish in Illinois is to be determined.

MUSSEL SURVEY

Methods

Mussels were collected from the Kankakee River at the Illinois Route 53 bridge in Wilmington on 7 September 1984 for the purpose of determining the species composition and relative abundance of the unionid mussel population at the site to be affected by the proposed IDOT project (Figure 1). Collections were made under the supervision of INHS malacologist Jeanine M. Kasprovicz, with the assistance of INHS biologists Kevin S. Cummings, Jeffrey T. Irish, Jean E. Karnes, Patti L. Malmborg, Chris A. Mayer, Pat J. McKenna, Mark A. Phipps, Sherri L. Sandberg, and Mark J. Wetzel. Approximately 30 man-hours of field sampling were expended during this mussel survey.

The study site was 43,060 m², extending to both banks of the river and encompassing a reach of the river from 70 m upstream to 217 m downstream of a line bisecting the present Illinois Route 53 bridge. Approximately 41,531 m² of this area (excluding the exposed boulder and gravel 'islands') were sampled by sections roughly defined with respect to the bridge and each shoreline (Figure 3). Each section was sampled by hand, in most cases as completely as possible. The substrate in sections 9, 10, 11, and 12 was composed almost entirely of bedrock; no mussels were collected from these areas.

Most mussels collected from each section were identified, enumerated, and returned alive to the river. A few specimens were returned to the laboratory for positive identification. One or two individuals of most species were retained as voucher specimens. All retained specimens were deposited in the INHS mollusk collection.

Results

During this survey 480 individuals representing 9 genera and 11 species of mussels were collected (Table 3), with *Actinonaias carinata* (Barnes) accounting for 88.75% of the collection. Other species which made up more than 1% of the collection included *Ligumia recta* (Lamarck) (3.54%), *Amblema plicata* (Say) (2.92%), *Lampsilis radiata siliquoidea* (Barnes) (1.46%), *Alasmidonta marginata* Say (1.25%), and *Lampsilis ovata ventricosa* (Barnes) (1.04%). In addition, two taxa of non-unionid bivalves also were documented: the Asiatic clam *Corbicula fluminea* (Muller) and the fingernail clam *Musculium* sp.

Riffles, with substrate composed of sand, gravel, rubble, and with a moderate current, supported the greatest abundance of mussels, particularly *Actinonaias carinata*. Table 4 lists the area sampled in each section, and the number of individuals and number of species of mussels collected from those sections (Figure 3).

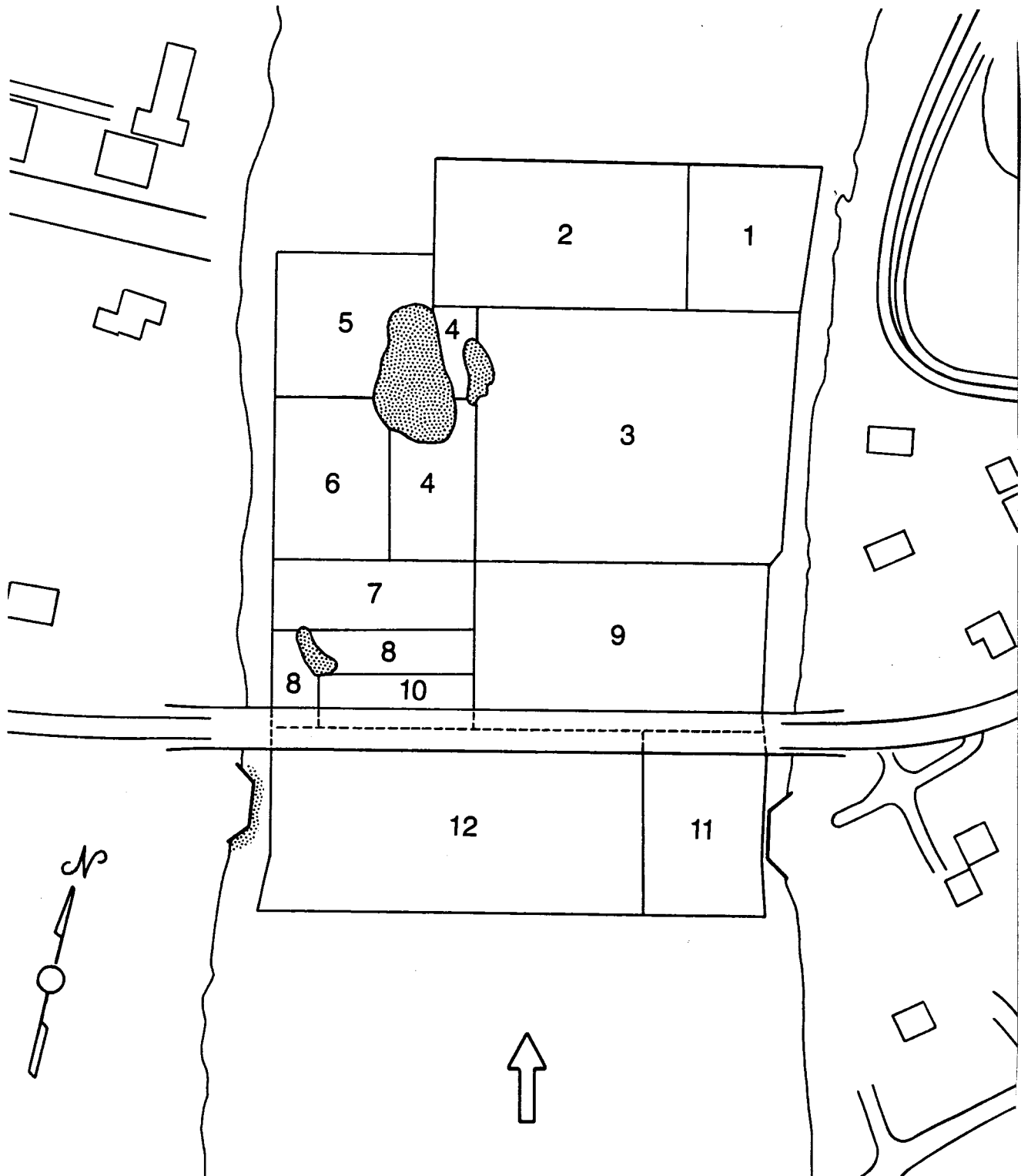


Figure 3. Location of sections of the Kankakee River at Wilmington in Will County, Illinois, sampled for mussels on 7 September 1984.

Table 3. Species and numbers of mussels collected 7 September 1984 from the Kankakee River at the Illinois Route 53 bridge in Wilmington, Will County, Illinois.

SPECIES	NUMBER
CLASS PELECYPODA	
Order Eulamellibranchia	
Superfamily Unionacea	
Family Unionidae	
<i>Actinonaias carinata</i> (Barnes)	426
<i>Actinonaias ellipsiformis</i> (Conrad)	1
<i>Alasmidonta marginata</i> Say	6
<i>Amblema plicata</i> (Say)	14
<i>Cyclonaias tuberculata</i> (Rafinesque)	1
<i>Lampsilis ovata f. ventricosa</i> (Barnes)	5
<i>Lampsilis radiata siliquioidea</i> (Barnes)	7
<i>Ligumia recta</i> (Lamarck)	17
<i>Plethobasus cyphus</i> (Rafinesque)	1
<i>Pleurobema cordatum</i> (Rafinesque)	1
<i>Quadrula metanevra</i> (Rafinesque)	1
Superfamily Sphaeriacea	
Family Corbiculidae	
<i>Corbicula fluminea</i> (Muller)	+
Family Sphaeriidae	
<i>Musculium</i> sp.	+
Total	
480	

+ indicates presence of these taxa; actual numbers of individuals were not tabulated.

Table 4. Number of individuals and species of mussels collected 7 September 1984 from the Kankakee River at the Illinois Route 53 bridge in Wilmington, Will County, Illinois.

Section	Area (m ²)	# of Individuals	# of species
1	2,063	18	3
2	4,306	42	6
3	9,311	54	6
4	1,595	54	3
5	1,897	56	4
6	2,093	74	3
7	1,475	134	6
8	1,163	48	4
9	5,581	-	-
10	997	-	-
11	2,558	-	-
12	8,492	-	-
Total	41,531	Total 480	

Discussion

The mussel community in the vicinity of the Illinois Route 53 bridge in Wilmington, Will County, Illinois, is one of the more abundant and diverse of those presently known from the Kankakee River. Eleven species of unionid mussels were collected from the Illinois Route 53 bridge site during this survey on 7 September 1984.

Because sampling methods are difficult to standardize, results from various mussel surveys are not easily compared. Conditions such as depth, flow, water temperature, substrate, and weather may be more or less favorable during different studies, and amount of effort expended per unit area sampled varies. Even when the effects of such variables are minimized, apparently random fluctuations in mussel populations at the same site have been observed from year to year (Van Cleve 1940). Nevertheless, some idea of the quality of the mussel community at the Illinois Route 53 bridge site can be obtained by comparing the results of other recent surveys, summarized below, with the findings of the present study. Extremely favorable sampling conditions were present during the Illinois Route 53 bridge survey on 7 September 1984.

Five Kankakee River locations in Illinois were sampled in 1976 and 1978 by Lewis and Brice (1980). Eighteen species of live unionid mussels were collected in their study, 15 of which were present at their Custer Park site (8 km upstream of the Illinois Route 53 bridge). This site also was sampled quantitatively using SCUBA and wading (Brice and Lewis 1979), and yielded densities of 0 to 56 mussels/m².

During her 1978 survey, Suloway (1981) sampled 13 river locations throughout the 90 km length of the Kankakee River in Illinois. One of her sampling sites (Station 12) was located downstream of the Wilmington Island dam, adjacent to the upstream (southern) terminus of this present survey. Of the eight species collected by Suloway in 1978 from this site, three - *Lasmigona complanata* (Barnes), *Lasmigona costata* (Rafinesque), and *Quadrula pustulosa* (Lea) - were not collected during the present Illinois Route 53 study. *Lasmigona complanata* and *L. costata* also were collected by Suloway in 1978 at her station 13, located 7 km downstream of the present Illinois Route 53 survey.

Thirteen species of unionid mussels were collected by INHS personnel during October 1979 from a stretch of the Kankakee River between Aroma Park (approximately 41.5 km upstream from the Illinois Route 53 bridge) and the Illinois-Indiana border (Brigham *et al.* 1981).

Brigham *et al.* (1984) recently conducted a mussel survey at a site 35 km upstream of the Illinois Route 53 bridge in connection with a City of Kankakee sewer interceptor project at Bird Park. Quantitative sampling of 36 quadrats (0.5 m²) with SCUBA and wading revealed densities from 0 to 14 mussels/m². Eleven species were collected.

Seventeen species of unionid mussels were collected from the vicinity of the Washington Avenue bridge in Kankakee on 21 September 1984 (Wetzel *et al.* 1984a).

A survey of Kankakee River mussels was conducted on 27 September 1984 for the City of Kankakee (Wetzel *et al.* 1984 b) in conjunction with the reconstruction of the hydroelectric plant at the Kankakee Dam. During this survey, 33 individuals representing 6 genera and 7 species (*Actinonaias carinata*, *Anodonta grandis* Say, *Anodonta imbecillis*, *Lampsilis radiata siliquoidea* (Barnes), *Lasmigona complanata*, *Lasmigona costata*, and *Quadrula pustulosa*) were retrieved by a SCUBA diver from depths of 0.8 to 6.8 m.

Fourteen species of unionid mussels have been collected from the Kankakee River in the vicinity of the Illinois Route 53 bridge since 1978; 11 of these were collected during this present study. The mussel community at this site thus appears to be one of the more diverse, as well as one of the more abundant, of those known from the Kankakee River in Illinois.

PRESENT STATUS OF MUSSELS IN THE KANKAKEE RIVER

Approximately 50 percent of the known species of freshwater mussels in the world occur in eastern North America (Stansbery 1970), achieving their greatest diversity in the Mississippi River basin (Johnson 1970). Significant depletions in both numbers of individuals and species have occurred in the last century throughout the country and have been documented for river systems such as the Illinois (Starrett 1971); Kankakee (Brigham *et al.* 1981; Suloway 1981); Kaskaskia (Suloway, Suloway, and Herricks 1981); Little Wabash (L. Suloway, unpublished); Ohio and Tennessee (Stansbery 1970); Rock (Miller 1972); Vermilion (Matteson and Dexter 1966; Suloway 1975); and the Wabash (Krumholz, Bingham, and Meyer 1970). A special case can be made for the protection of this unique fauna (Brigham *et al.* 1981).

In response to the decline in mussel populations, federal and state governments have enacted legislation to protect several species. The federal government currently lists 22 species of mussels found in the United States as endangered (U. S. Department of the Interior [USDI] 1984 ϕ). Lists of endangered, threatened, rare, or protected mussels also have been established by several states adjacent to or near Illinois, including Alabama (Stansbery 1976); Arkansas (Sam Barkley, Arkansas Game and Fish Commission, pers. comm.), Indiana (Indiana Revised Statutes 1984), Kentucky (Babcock 1977, Branson *et al.* 1981); Michigan (van der Schalie 1975), Minnesota (Anon. 1984), Missouri (Wilson 1984); and Ohio and Wisconsin (McGaugh and Genoways 1976).

Illinois (Illinois Administrative Code 1984) recently emended their list of endangered and threatened species of vertebrates and plants to include nine federally endangered mussels presently occurring or known to formerly have occurred in Illinois waters. A number of freshwater mussels presently occurring or known to have occurred formerly in Illinois were proposed to the Endangered Species Technical Advisory Committee for state listing by INHS personnel on 26 March 1985 (Liane Suloway, pers. comm.), including *Plethobasus cyphus*, a species (one specimen) collected on 7 September 1984 from the Kankakee River at Wilmington in Will County (Kasprowicz *et al.* 1985).

Studies during the last 100 years have yielded 37 species of mussels from the Kankakee River and its tributaries. Of these, only one, *Lampsilis higginsii* (Lea) (= *Lampsilis orbiculata* of Burch 1975), currently is considered

federally endangered. Two other species reported from the Kankakee River, *Cumberlandia monodonta* (Say) and *Simpsoniconcha* (= *Simpsonaias*) *ambigua* (Say), currently are assigned to Category 2 ([USDI] 1984 b), which means they are proposed for federal listing as endangered or threatened, but that conclusive data on biological vulnerability and threat currently are not available. These species have not been reported from the Kankakee River since 1906 (Suloway 1981). Eighteen of the 37 mussel species known to have occurred in the Kankakee River basin are listed as endangered, threatened, or rare in various states (Indiana, Kentucky, Michigan, Missouri, or Ohio). None of the 11 mussel species presently known to occur in the Kankakee River in the vicinity of the Illinois Route 53 bridge in Wilmington currently are listed as federally endangered.

The general decline in the mussel fauna of the Kankakee River in Illinois may be due to several factors, including pollution (domestic and industrial effluents, and fertilizer and pesticide runoff), habitat destruction (dam construction, and increased sedimentation resulting from dredging and channelization, particularly in Indiana), and overharvest (commercial clamming, first during the early and mid-1900's for the pearl button industry, and recently for the cultured pearl industry in Japan). Only 20 species of freshwater mussels have been collected from the Kankakee River since 1978. Based upon available historical and current information, several species of mussels reported from the Kankakee River in Illinois presently could be considered uncommon or localized in Illinois, and in some cases the United States. Three species found during this study, *Cyclonaias tuberculata* (Rafinesque), *Ligumia recta* (Lamarck), and *Plethobasus cyphus* (Rafinesque) could be considered uncommon and on the decline in Illinois.

Cyclonaias tuberculata was collected by Matteson from the Fox, Kankakee, and the Vermilion (Wabash drainage) rivers during the 1950's. In Illinois, it recently has been collected from the Kankakee, Vermilion, Rock, and Ohio rivers but apparently is absent from the Des Plaines and Spoon rivers. It is uncommon and possibly extirpated from the upper Mississippi River.

Ligumia recta was collected by Matteson (INHS Mollusc Collection) from the Fox and Kankakee rivers and the Rock River basin during the 1950's. This species was considered rare even at that time. This species recently has been collected from the Kankakee and Rock rivers, and also has been observed in the Mississippi (where it is rare) and the Ohio rivers in Illinois. Although this species once was common in the Illinois River, it apparently is extirpated now. This species also appears to be extirpated from the Kaskaskia and Spoon rivers in Illinois.

Although *Simpsoniconcha ambigua* has not been collected from the Kankakee River since 1906, the restricted habitat in which this species is known to have occurred is present within the study area. Since this species currently is under consideration for Category 2 by the USDI (1984 b), we are including a historical account of this species' known occurrence in Illinois. A historical account of *Plethobasus cyphus* also is included. Although *P. cyphus* currently is not under consideration for federal listing by the USDI (1984 b), it nonetheless is a very rare species in Illinois.

HISTORICAL ACCOUNTS OF MUSSELS FOUND IN THE KANKAKEE RIVER SYSTEM

Simpsoniconcha (= *Simpsonaias*) *ambigua* (Say) - Salamander mussel

Baker (1898) stated that "This species also seems to be restricted to the Desplaines River and its tributaries, and is very abundant; when one is found, dozens or even hundreds of individuals may be found near by." According to Baker (1906), this species formerly was present in the Des Plaines, Kankakee, Spoon, and Wabash rivers in Illinois. It was collected from the Mississippi River at Prairie du Chien, Wisconsin by Ellis in the 1930's (van der Schalie and van der Schalie 1950). Goodrich and van der Schalie (1944) recorded *Simpsoniconcha ambigua* from the Wabash River, but indicated that it was very sporadic in distribution. Howard (1951) collected this species from Hickory Creek, a tributary of the Des Plaines River.

The lack of recent records of *Simpsoniconcha ambigua* may be due primarily to its scarcity. However, since this species has been collected almost exclusively from areas under bedrock ledges and large flat rocks (Baker 1898; Howard 1951), it is likely to be overlooked during collecting unless this specific habitat is searched. This species may still persist in some areas of Illinois. Howard observed that the glochidial host for *Simpsoniconcha ambigua* is an amphibian, the mudpuppy (*Necturus maculosus*).

Present status of *Simpsoniconcha ambigua*: The U.S. Department of the Interior, Fish and Wildlife Service ([USDI] 1984b) identified invertebrate animal taxa, native to the United States, which are being considered for addition to the List of Endangered and Threatened Wildlife. In responding to the Endangered Species Act of 1973 (16th U.S. Congress, docket 1531), which requires the determination of whether species of wildlife and plants are endangered or threatened based upon the best available scientific and commercial data, the Fish and Wildlife Service (FWS) has gathered data on taxa which have appeared at times to warrant consideration for this list of endangered and threatened wildlife. In consideration of these data, the FWS has assigned many of these taxa to one of three categories.

Simpsoniconcha ambigua has been proposed for federal listing under Category 2, which comprises taxa for which information now in possession of the FWS indicates that listing the species as Endangered or Threatened may be appropriate, but for which substantial biological data are not currently available to support a proposed rule. Further biological research and field study usually will be necessary to ascertain the status of the taxa in this category, and it is likely that some of the taxa will not warrant listing.

Simpsoniconcha ambigua has not been recorded from any drainage in Illinois since Howard (1951) collected it from Hickory Creek, a tributary of the Des Plaines River. Neither Page *et al.* [1979], Lewis and Brice (1980), Brigham *et al.* (1981), Suloway (1981), Brigham *et al.* (1984), nor Wetzel *et al.* (1984a; 1984b) collected this species from the Kankakee.

Simpsoniconcha ambigua was not collected during this survey, although suitable habitat appears to be present both upstream and downstream of the existing Illinois Route 53 bridge in Wilmington. Baker's (1906) Kankakee record of this species was from Wilmington.

Plethobasus cyphus (Rafinesque) - Bullhead (sheepnose) mussel

Kankakee River: As early as 1912, this species had been reported as very rare in the Kankakee River by Wilson and Clark (1912). *Plethobasus cyphus* was collected by Matteson (INHS Mollusc Collection) only from the Kankakee and Kaskaskia rivers in Illinois during the 1950's. Lewis and Brice (1980) found only dead shells of this species in 1976 and 1978; Suloway did not collect it at all in 1978. Other recent surveys of Kankakee River mussels Page *et al.* [1979]; Brigham *et al.* 1981; Brigham *et al.* 1984; Wetzel 1984 a; Wetzel 1984 b) did not report this species. One specimen was collected from the Kankakee River at Wilmington (Will County) during this study.

Elsewhere in Illinois: Baker's (1906) records indicated that *Plethobasus cyphus* once was present in the Fox, Green, Illinois, Kankakee, Kaskaskia, Mississippi, Rock, Spoon, and Wabash rivers in Illinois. In the 1870's, Calkins (1874) found *P. cyphus* occurring abundantly in the Illinois River in LaSalle (Starved Rock pool). However, subsequent investigations on the Illinois River found live specimens of this species either rarely (Danglade 1914) or not at all (Forbes and Richardson 1913; Starrett 1971; Morrisson, pers. comm. to Starrett in Starrett 1971; and Parmalee, pers. comm. to Starrett in Starrett 1971). Starrett suggested that *Plethobasus cyphus* apparently has been extirpated from the Illinois River, resulting from pollution and reduction in current caused by dams.

Plethobasus cyphus may be present in the lower Wabash and Ohio rivers (Parmalee 1967), although recent records of this species occurring in the Upper Mississippi River are "exceedingly rare", according to Fuller (1978). Suloway (1981) suggested that the range of this species is becoming increasingly restricted.

Fuller (1974) listed the sauger (*Stizostedion canadense*) as the host fish for *Plethobasus cyphus*.

Present status of *Plethobasus cyphus*: *Plethobasus cyphus* is listed as endangered in Missouri (Nordstrom *et al.* 1977), and a species "of special concern" in Indiana (Indiana Revised Statutes 1984). Currently, this species is not under consideration for federal listing by the USDI (1984 b).

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