



**I L L I N O I S**

**UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN**

**PRODUCTION NOTE**

**University of Illinois at  
Urbana-Champaign Library  
Large-scale Digitization Project, 2007.**



INHS  
BIOD  
1998(12)

Natural History Survey  
Library

Freshwater Mussels, Crayfishes, and Fishes  
of the  
Little Vermilion River Drainage, Illinois

Kevin S. Cummings, Lawrence M. Page, Christine A. Mayer, and Mark H. Sabaj

Center for Biodiversity  
Technical Report 1998 (12)

Illinois Natural History Survey  
607 East Peabody Drive  
Champaign, Illinois 61820

Prepared for

Illinois Department of Natural Resources  
Division of Natural Heritage  
Springfield, Illinois

Study Funded by a Grant from the

Illinois Wildlife Preservation Fund  
Illinois Department of Natural Resources  
Division of Natural Heritage  
Springfield, Illinois



# Freshwater Mussels, Crayfishes, and Fishes of the Little Vermilion River Drainage, Illinois

Kevin S. Cummings, Lawrence M. Page, Christine A. Mayer, and Mark H. Sabaj

Illinois Natural History Survey  
Center for Biodiversity  
Champaign, Illinois 61820

## INTRODUCTION

The Little Vermilion is a small river, 50 miles (30 in Illinois) in length, which originates in Champaign County (Page, et al. 1992). It drains 213 square miles (196 in Illinois) before entering the Wabash River near Newport, Indiana. One and one half miles of the stream were impounded in 1936 to create the Georgetown Reservoir. Below the reservoir the substrate is cobble and gravel with scattered boulders. Upstream of the impoundment the substrate is largely sand and gravel. The headwaters of the Little Vermilion River have been channelized and are periodically dredged and cleared by the local drainage district (Sauer 1989). A 1.2-mile stretch of the Little Vermilion River has been designated as Illinois' first river nature preserve — Carl Flierman's River Nature Preserve.

Numerous ranking systems have identified the Little Vermilion as one of the finest streams in the state. The Little Vermilion (in Vermilion County) was rated among the ten most outstanding aquatic ecosystems in Illinois (Page, et al. 1989) and was designated as a Biologically Significant Stream based on the recent occurrence of endangered species (*Notropis boops*, bigeye shiner, *Nocomis micropogon*, river chub, *Alasmidonta viridis*, slippershell, and *Villosa lienosa*, little spectacle case) (Page, et al. 1992).

The Biological Stream Characterization (Bertrand, et al. 1996) rated the Little Vermilion River from the state line to the dam at Georgetown and upstream of Archie Creek near Sidell as a Class "A" Stream (Unique Aquatic Resource). From the dam at Georgetown upstream to Archie Creek the river was rated as a Class "B" Stream (Highly Valued Aquatic Resource).

In the Illinois Water Quality Report (IEPA 1996), the portion of the Little Vermilion River that lies in Illinois was rated as "Full Support" (water quality meets the needs of all designated uses protected by applicable water quality standards).

The objectives of this study were to document and evaluate habitat conditions and the mussel, crayfish, and fish populations in the upper Little Vermilion River with special emphasis on state-listed species, to document the extent of hydrologic alteration of the river upstream of the current reservoir, and to estimate the upstream impacts of a proposed raising of the dam at Georgetown.

## **METHODS**

### **Freshwater Mussels**

Live mussels and shells of dead individuals were surveyed at 20 sites in the Little Vermilion River drainage during 1997 (Table 1, Figure 1). Each site was sampled by hand and an effort was made to sample all available habitats, but particular emphasis was placed on areas that appeared likely to support mussels (i.e. gravel riffles and runs). Collections were quantified on a catch per unit effort basis, and the time spent at each site varied from 0.5 to 3 man-hours. Voucher specimens were obtained at each site and deposited in the Illinois Natural History Survey Mollusk Collection (INHS), Champaign, Illinois. Nomenclature in this report follows Turgeon et al. (1988) except that (1) no subspecies are recognized and (2) some modifications have been made to correct errors of spelling or date of publication or to reflect published changes in nomenclature since 1988 (i.e., Hoeh 1990).

### **Crayfishes and Fishes**

Crayfishes and fishes were surveyed at nine and eight sites, respectively, in the Little Vermilion drainage in 1997 (Table 1, Figure 1). Each site was sampled using nylon minnow seines (6 x 10 ft, 1/8" sq. mesh), a bag seine (6 x 30 ft with 6 x 6 x 6 ft bag, 1/8" sq. mesh) and/or a Smith-Root backpack electrofisher powered by a 24 volt, 12Ah battery (model 12-B). Time spent at each site varied from 2 to 4 man hours. Voucher specimens were first anesthetized with MS-222 and then fixed in 10% formalin. Fixed specimens were transferred to 70% ethyl alcohol for permanent storage in the Illinois Natural History Survey Fish Collection. Nomenclature follows Page and Burr (1991) for fishes and Williams et al. (1989) for crayfishes.

Table 1. Collection sites for mussels, crayfishes, and fishes in the Little Vermilion River drainage, 1997. All sites in Vermilion County except Site 1 which was in Champaign County. M = mussels surveyed, C = crayfishes surveyed, F = fishes surveyed.

Little Vermilion River

1. 4 mi S Homer, Co. Rd. 600N; T18N, R14W, sec. 32, SE.	M
2. 3 mi NE Allerton, Co. Rd. 500N; T17N, R14W, sec. 7, SW.	M
3. 1 mi N Sidell, Co. Rd. 600E; T17N, R13W, sec. 21, NE.	M C F
4. 2 mi E Sidell, Co. Rd. 300N; T17N, R13W, sec. 23, SW.	M
5. 2.9 mi ESE Sidell, Co. Rd. 890E; T17N, R13W, sec. 25, SE.	M
6. 1 mi SE Indianola; T17N, R12W, sec. 20, SE.	M C F
7. 2 mi ENE Indianola, Co. Rd. 1270E; T17N, R12W, sec. 15, E.	M
8. 3 mi ENE Indianola; T17N, R12W, sec. 14, NW.	M C F
9. 2.1 mi W Olivet; T17N, R12W, sec. 11, SE.	C F
10. 1 mi SSW Georgetown, below dam; T17N, R12W, sec. 6, SE.	M
11. 1 mi S Georgetown, Rt. 1; T17N, R11W, sec. 6.	M
12. 1.5 mi E Georgetown, Co. Rd. 1800E; T18N, R11W, sec. 34, SW.	M C
13. 3 mi ESE Georgetown; T17N, R11W, sec. 2, NW.	C F
14. 4 mi SE Georgetown, Co. Rd. 600N; T17N, R11W, sec. 2, SE.	M
15. 4 mi SE Georgetown; T17N, R11W, sec. 12, SW.	M C F

Baum Branch

16. 1.5 mi NNW Sidell, Co. Rd. 450N; T17N, R13W, sec. 16, N.	M
--	---

Swank Creek

17. 1.5 mi NW Indianola, Co. Rd. 550N; T17N, R12W, sec. 7, E.	M
---	---

Fayette Creek

18. 4 mi SW Georgetown, Co. Rd. 1270E; T17N, R12W, sec. 10, SE.	M
---	---

Fairview Drainage Ditch

19. 3 mi SW Georgetown, Co. Rd. 570N; T17N, R12W, sec. 11, NW.	M C F
--	-------

unnamed trib. to Little Vermilion River

20. 1.5 mi SE Indianola; T17N, R12W, sec. 22, NW.	M C F
---	-------

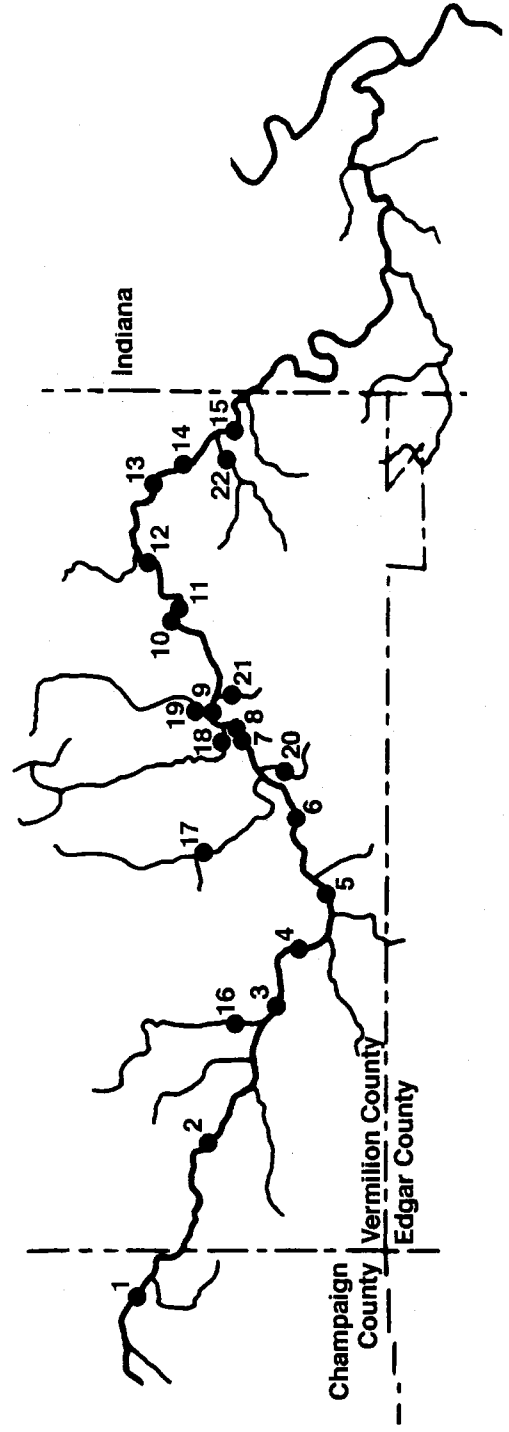
unnamed trib. to Little Vermilion River

21. 1 mi NW Vermilion Grove; T17N, R12W, sec. 14, NE.	M
---	---

Yankee Branch

22. 4 mi E Olivet, Co. Rd. 500N; T17N, R11W, sec. 11, SE.	M
---	---

Figure 1. Mussel, crayfish, and fish collection sites in the Little Vermilion River drainage, Illinois, 1997. The Georgetown dam is immediately upstream of Site 10.





## RESULTS AND DISCUSSION

### Freshwater Mussels

Freshwater mussels have been decimated throughout the eastern United States and are often recognized as the most endangered group of animals in North America (Williams et al. 1993). The freshwater mussels of the Little Vermilion River drainage have never been systematically studied. A survey of the Vermilion River drainage was conducted in 1918-1920 (Baker 1922). Baker sampled 31 sites in the Middle and Salt forks of the drainage but did not survey the North Fork or Little Vermilion rivers. In his statewide survey of the interior streams of Illinois, Max Matteson of the University of Illinois sampled only one site in the Little Vermilion River in 1960. A search of museum collections across the country revealed only two specimens from the basin; both were the state endangered little spectaclecase, *Villosa lienosa*. Collections obtained from sporadic sampling by ichthyologists, IDOT, and INHS/IDNR streams crews in the 1980s and 1990s have provided nearly all of the base-line information on the mussel fauna of the river. A compilation of all available data up to January 1997 revealed that twenty-one species were known to occur in the Little Vermilion River basin.

In 1997, twenty mussel species were collected from 20 sites in the Little Vermilion River drainage, three of which (*Alasmidonta marginata*, elktoe, *Leptodea fragilis*, fragile papershell, and *Ptychobranchnus fasciolaris*, kidneyshell) are newly reported from the drainage. The 1997 data, combined with the historical collections, brings the total number of mussel species documented from the Little Vermilion River to 24, six of which are currently listed as threatened or endangered by the state of Illinois (Table 2).

The introduced Asian clam (*Corbicula fluminea*) is also found in the Little Vermilion River drainage but is common only below the dam. It was collected alive at sites 3, 11, 12, 14, and 15 and as shells only at sites 10 and 19. Effects of the Asian clam on native species and communities are difficult to measure, but some studies have suggested that the Asian clam may compete with native mussels for food (Clarke, 1986).

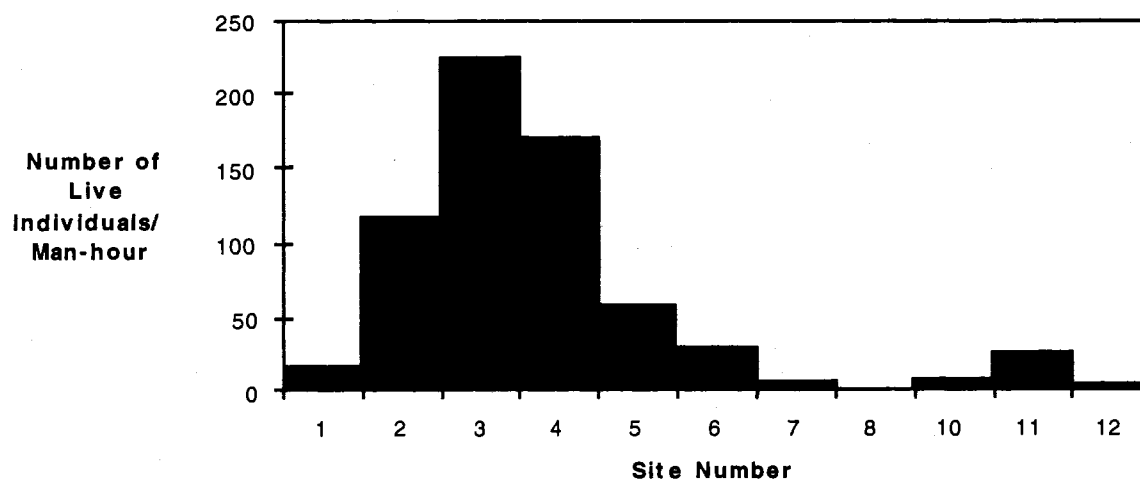
Of the 20 species collected in 1997, 17 were found alive and 3 were represented by shells only (Table 2). The top five species in order of abundance were fatmucket (*Lampsilis siliquoidea*), threeridge (*Amblema plicata*), little spectaclecase (*Villosa lienosa*), Wabash pigtoe (*Fusconaia flava*), and giant floater (*Pyganodon grandis*). Together they comprised 93% of the living mussels collected.

Table 2. Unionids of the Little Vermilion River drainage, Illinois. SE = Illinois state endangered, ST = Illinois state threatened, I = Introduced. Numbers represent live mussels found in 1997. D = fresh-dead shell, WD = weathered dead shell. Species not collected in 1997 annotated with year last collected in parentheses.

Unionidae			
Anodontinae (9)			
<i>Alasmidonta marginata</i>	elktoe	D	
<i>Alasmidonta viridis</i> <sup>SE</sup>	slippershell mussel	3	
<i>Anodontooides ferussacianus</i>	cylindrical papershell	2	
<i>Lasmigona complanata</i>	white heelsplitter	14	
<i>Lasmigona compressa</i>	creek heelsplitter	4	
<i>Lasmigona costata</i>	flutedshell	3	
<i>Pyganodon grandis</i>	giant floater	35	
<i>Strophitus undulatus</i>	squawfoot	1	
<i>Utterbackia imbecillis</i>	paper pondshell	3	
Ambleminae (6)			
<i>Amblema plicata</i>	threeridge	101	
<i>Elliptio dilatata</i> <sup>ST</sup>	spike	WD	(1994)
<i>Fusconaia flava</i>	Wabash pigtoe	44	
<i>Quadrula pustulosa</i>	pimpleback	WD	(1996)
<i>Quadrula quadrula</i>	mapleleaf	1	
<i>Unio merus tetralasmus</i>	pondhorn	3	
Lampsilinae (9)			
<i>Actinonaias ligamentina</i>	mucket	D	(1990)
<i>Lampsilis cardium</i>	plain pocketbook	23	
<i>Lampsilis siliquoidea</i>	fatmucket	574	
<i>Leptodea fragilis</i>	fragile papershell	2	
<i>Ptychobranhus fasciolaris</i> <sup>SE</sup>	kidneyshell	WD	
<i>Toxolasma lividus</i> <sup>SE</sup>	purple lilliput	WD	(1994)
<i>Toxolasma parvus</i>	lilliput	1	
<i>Villosa iris</i> <sup>SE</sup>	rainbow	WD	
<i>Villosa lienosa</i> <sup>SE</sup>	little spectaclecase	55	
Species Total		24	
Species 1997		20	
Species Alive 1997		17	
Individual Total		869	
Corbiculidae			
<i>Corbicula fluminea</i> <sup>1</sup>	Asian clam	36	

The greatest diversity (species richness and abundance) occurred in the five upstream localities around the town of Sidell (Table 2, Figure 1). Sites 2-6 yielded the greatest number of mussels per man-hour of collection (29 or greater) and, with the exception of site 10 (near Georgetown), contained the greatest number of live species at a given site (range 5-8) (Table 3, Figure 2). Site 10 supported the most species (14), but only seven of those were found alive. The section of the river near Sidell supports the largest population of the little spectaclecase remaining in the state and perhaps the entire Wabash River system. Any attempts to dredge or further channelize this stretch of the river should be prohibited or vigorously scrutinized.

Figure 2. Number of live mussels collected per man-hour by site from the Little Vermilion River mainstem, 1997. Mussels were not collected at sites 9 and 13. The Georgetown dam is between sites 8 and 10.



The sites closest to the dam (7 & 8) were not very diverse. Nine species of mussels were found, but only six individuals of four species were collected alive. Whether this is attributable to a lack of good quality habitat or reflects the difficulty in collecting this part of the river (snags, deep water, few access points) is uncertain.

Most freshwater mussel species are naturally adapted to life in flowing waters. Very few species can survive in lakes or lentic conditions. Upstream of the Georgetown Reservoir, mussel populations were depauperate at sites closest to the lake (Table 3, Figure 2). Many factors may account for the lack of mussels in this region, but the dam and its hydrologic alteration of the river



has likely had an impact. When a reservoir is placed on a stream, the natural hydrology of the stream is altered. As the reservoir expands and fills, water velocity above the impoundment drops and sedimentation in and above the impoundment increases. The distance or extent of the upstream effects are impossible to predict without a detailed hydrological study (Mike Demissee, Illinois State Water Survey, pers. comm.). The immediate impact on endangered mussels is likewise difficult to predict. However, if flows are drastically changed in the area near Sidell, resulting losses of endangered mussels could be substantial.

### **Freshwater Crayfishes**

In 1997, three species of crayfishes were collected from nine sites in the Little Vermilion River drainage. In 1996, INHS scientists collected two additional species (*Cambarus tenebrosus* and *Orconectes immunis*) from the Little Vermilion River near site 13. Prior to 1996, neither of these species had been recorded from the drainage (Page 1985; INHS Crustacean Collection database). Based on the 1996-97 data, five species of crayfishes currently occur in the Little Vermilion River drainage (Table 4). None of these species is listed as state threatened or endangered; however, *C. tenebrosus* has a limited range in Illinois, occurring only in the Shawnee Hills in southern Illinois and the Vermilion and Little Vermilion drainages in east-central Illinois.

### **Freshwater Fishes**

Prior to 1997, 52 fish species were recorded from the Little Vermilion River drainage based on collections dating back to 1899 (Smith 1979, Sauer 1989, INHS Fish Collection database) (Table 5). These historical records include a survey of the Little Vermilion River conducted in 1989 in which 48 fish species were collected in seven stations along the main river channel (Sauer 1989).

In 1997, 44 species of fishes were collected by Survey staff at eight sites in the Little Vermilion River drainage (Tables 1 & 5, Figure 1). IDNR streams crew also made one collection in the Little Vermilion River at site 13. With these data combined, 46 species of fishes were taken in the Little Vermilion drainage in 1997. Four species were newly recorded for the drainage: Mississippi silvery minnow (*Hybognathus nuchalis*), quillback (*Carpionodes cyprinus*), yellow bullhead (*Ameiurus natalis*), and channel catfish (*Ictalurus punctatus*). A fifth species, bigeye chub (*Hybopsis amblops*), previously was known from the Little Vermilion River by only one specimen taken in 1992 (Burr et al. 1996). Eleven species previously recorded from the Little Vermilion River drainage were not observed in 1997. All of the species not re-sampled in 1997 are expected to still occur in the Little Vermilion River drainage, except for perhaps the highfin carpsucker (*Carpionodes velifer*) which was last collected in 1899. The 1997 data combined with the historical records brings to 57 the total number of fishes documented from the Little Vermilion River.

Table 4. Crayfishes of the Little Vermilion River drainage, Illinois. Species not collected in 1997 annotated with year last collected in parentheses.

		pre-1997	1997
Cambaridae			
<i>Cambarus diogenes</i>	devil crawfish	x	x
<i>Cambarus tenebrosus</i>	-	x (1996)	
<i>Orconectes immunis</i>	calico crayfish	x (1996)	
<i>Orconectes propinquus</i>	northern clearwater crayfish	x	x
<i>Orconectes virilis</i>	virile crayfish	x	x
Species total per survey		5	3
Species total for Little Vermilion River drainage = 5			

Table 5. Fishes of the Little Vermilion River drainage, Illinois. SE = Illinois state endangered, WL-SC = Illinois state watch list - special concern, I = Introduced. Species not collected in 1997 annotated with year last collected in parentheses. 1 = records taken from INHS Fish Collection, Sauer 1989, and Burr et al. 1996. 2 = IDNR stream crew survey (site 13), 3 = Cummings et al. survey (sites 1-8), 4 = hybrid not included.

		pre-1997 <sup>1</sup>	1997 <sup>2</sup>	1997 <sup>3</sup>
Petromyzontidae				
<i>Lampetra appendix</i>	American brook lamprey	x (1989)		
Clupeidae				
<i>Dorosoma cepedianum</i>	gizzard shad	x	x	x
Cyprinidae				
<i>Campostoma anomalum</i>	central stoneroller	x	x	x
<i>Cyprinella spiloptera</i>	spotfin shiner	x	x	x
<i>Cyprinella whipplei</i>	steelcolor shiner	x		x
<i>Cyprinus carpio</i> <sup>1</sup>	common carp	x	x	x
<i>Ericymba buccata</i>	silverjaw minnow	x	x	x
<i>Hybognathus nuchalis</i> <sup>WL-SC</sup>	Mississippi silvery minnow		x	x
<i>Hybopsis amblops</i> <sup>SE</sup>	bigeye chub	x	x	x
<i>Luxilus chrysocephalus</i>	striped shiner	x	x	x
<i>Lythrurus umbratilis</i>	redfin shiner	x	x	x
<i>Nocomis micropogon</i> <sup>SE</sup>	river chub	x (1992)		
<i>Notemigonus crysoleucas</i>	golden shiner	x (1994)		
<i>Notropis atherinoides</i>	emerald shiner	x (1964)		
<i>Notropis boops</i> <sup>SE</sup>	bigeye shiner	x	x	x
<i>Notropis ludibundus</i>	sand shiner	x	x	x
<i>Notropis rubellus</i>	rosyface shiner	x (1989)		
<i>Phenacobius mirabilis</i>	suckermouth minnow	x		x
<i>Pimephales notatus</i>	bluntnose minnow	x	x	x
<i>Pimephales promelas</i>	fathead minnow	x (1956)		
<i>Semotilus atromaculatus</i>	creek chub	x	x	x

Table 5 (cont.).

		pre-1997 <sup>1</sup>	1997 <sup>2</sup>	1997 <sup>3</sup>
Catostomidae				
<i>Carpiodes cyprinus</i>	quillback		x	
<i>Carpiodes velifer</i>	highfin carpsucker	x (1899)		
<i>Catostomus commersoni</i>	white sucker	x	x	x
<i>Erimyzon oblongus</i>	creek chubsucker	x		x
<i>Hypentelium nigricans</i>	northern hog sucker	x	x	x
<i>Minytrema melanops</i>	spotted sucker	x	x	x
<i>Moxostoma anisurum</i>	silver redhorse	x	x	x
<i>Moxostoma duquesnei</i>	black redhorse	x	x	x
<i>Moxostoma erythrurum</i>	golden redhorse	x	x	x
<i>Moxostoma macrolepidotum</i>	shorthead redhorse	x	x	x
Ictaluridae				
<i>Ameiurus melas</i>	black bullhead	x (1989)		
<i>Ameiurus natalis</i>	yellow bullhead			x
<i>Ictalurus punctatus</i>	channel catfish		x	
<i>Noturus flavus</i>	stonecat	x	x	x
<i>Noturus miurus</i>	brindled madtom	x	x	x
Esocidae				
<i>Esox americanus</i>	grass pickerel	x		x
Atherinidae				
<i>Labidesthes sicculus</i>	brook silverside	x		x
Fundulidae				
<i>Fundulus notatus</i>	blackstripe topminnow	x	x	x
Centrarchidae				
<i>Ambloplites rupestris</i>	rock bass	x	x	x
<i>Lepomis cyanellus</i>	green sunfish	x	x	x
<i>Lepomis cyanellus</i> x <i>L. megalotis</i>	hybrid sunfish			x
<i>Lepomis humilis</i>	orangespotted sunfish	x (1989)		
<i>Lepomis macrochirus</i>	bluegill	x		x
<i>Lepomis megalotis</i>	longear sunfish	x	x	x
<i>Micropterus dolomieu</i>	smallmouth bass	x	x	x
<i>Micropterus punctulatus</i>	spotted bass	x	x	x
<i>Micropterus salmoides</i>	largemouth bass	x		x
<i>Pomoxis annularis</i>	white crappie	x (1989)		
<i>Pomoxis nigromaculatus</i>	black crappie	x (1989)		
Percidae				
<i>Etheostoma blennioides</i>	greenside darter	x	x	x
<i>Etheostoma caeruleum</i>	rainbow darter	x	x	x
<i>Etheostoma flabellare</i>	fantail darter	x		x
<i>Etheostoma nigrum</i>	johnny darter	x		x
<i>Etheostoma spectabile</i>	orangethroat darter	x		x
<i>Percina caprodes</i>	logperch	x		x
<i>Percina maculata</i>	blackside darter	x		x
<i>Percina sciera</i>	dusky darter	x	x	x
Species <sup>4</sup> total per survey		52	33	44
Species <sup>4</sup> total for Little Vermilion River drainage = 57 (56 native, 1 introduced)				

Three species recorded from the Little Vermilion drainage are currently listed as endangered by the state of Illinois: bigeye shiner (*Notropis boops*), bigeye chub (*Hybopsis amblops*), and river chub (*Nocomis micropogon*). A fourth species, Mississippi silvery minnow (*Hybognathus nuchalis*), is on the Illinois watch list as a species of special concern.

The greatest fish diversity (species richness and abundance) occurred in the Little Vermilion River downstream of the Georgetown Reservoir at site number 13. The two 1997 collections recorded 42 species including two state endangered fishes, bigeye shiner and bigeye chub. Forty-nine species of fishes are known from the Little Vermilion River downstream of the reservoir, and 37 species are known from upstream of the reservoir. Seven of the 37 species recorded upstream of the reservoir have not been collected downstream of the reservoir. None of these seven species are state-listed as endangered, threatened, or species of special concern.

### **Threatened and Endangered Species Accounts**

In the following accounts, each of the threatened or endangered species known from the Little Vermilion River is discussed with respect to its historical and present distribution and status in the Little Vermilion River and in Illinois. Species are listed by status and then alphabetically by genus.

#### **Illinois Endangered**

##### **Mussels**

*Alasmidonta viridis* - slippershell mussel: *Alasmidonta viridis* was historically widespread in the northern half of Illinois but has since been reduced to widely scattered populations throughout its range. The slippershell was found alive at three sites (3-5) in the upper part of the Little Vermilion River in 1997. The only live records for this species in the adjacent Vermilion River basin to the north were collected from Bean Creek (Middle Fork drainage) in 1989.

*Ptychobranchus fasciolaris* - kidneyshell: In Illinois, the kidneyshell was historically distributed at scattered sites in the Wabash River drainage. The only known population of this species is in the Embarras River near Hindsboro. Only one live *P. fasciolaris* has been collected in the Vermilion River drainage since 1980 and its status in that basin is uncertain.

*Toxolasma lividus* - purple lilliput: Historically, the purple lilliput was distributed at scattered localities in the Wabash/Ohio River drainage. It is currently thought to be limited to the upper North Fork Vermilion River and one site in Big Grande Pierre in Pope County. Weather-dead shells were found in the Little Vermilion River, 4 mi SE Georgetown in 1994 and represent the only known collection of this mussel in the drainage.



*Villosa iris* - rainbow: As with the preceding two species, the rainbow historically was distributed in the Wabash River and its tributaries. The only known extant population occurs in the North Fork Vermilion River in Vermilion County. Weather-dead shells were found in the Little Vermilion River, 3 and 4 mi SE Georgetown in 1994, 1996-97 and represent the only known collections of this mussel in the drainage.

*Villosa lienosa* - little spectaclecase: In Illinois, the little spectaclecase formerly was widely distributed in tributaries to the Wabash River. It is still extant in the upper North Fork Vermilion, the middle Embarras, and Little Vermilion rivers. The largest remaining population of this mussel in Illinois occurs in the upper Little Vermilion River. This species ranked 4th in overall abundance in the present survey and was common at sites 2-4.

### Fishes

*Hybopsis amblops* - bigeye chub: In Illinois, the bigeye chub historically was found in several Wabash River tributaries (Little Wabash, Embarras, Vermilion, Little Vermilion rivers and Brouilletts Creek) and in the upper Kaskaskia River drainage (Warren and Burr 1988, Burr, et al. 1996). Until recently, the bigeye chub was considered extirpated from Illinois (Smith 1979, Warren and Burr 1988). However, Burr et al. (1996) reported a single adult collected in the Little Vermilion River by IDOC stream biologists in 1992, representing the first collection of this species from Illinois since 1961. In 1997, the bigeye chub was found at site 13 downstream of the Georgetown Reservoir; fourteen specimens were found on 8 July and three specimens were found on 22 September 1997.

*Nocomis micropogon* - river chub: Burr et al. (1988) reported the first records of the river chub from the Little Vermilion River; earlier Illinois records included only two localities from the mainstem of the Wabash River in Clark and Lawrence counties (Smith 1979, Burr, et al. 1988). Sauer (1989) reported river chubs from downstream of the Georgetown Reservoir at two localities in the Little Vermilion River near our sites 12 and 14. Burr, et al. (1996) documented the presence of river chubs in 1992 downstream of the reservoir near our Little Vermilion River sites 13 and 15. The river chub was not observed in the Little Vermilion River in 1997; however, abundant rocky substrate in the Little Vermilion River provides appropriate feeding and nesting habitat for the species (Burr, et al. 1996, pers. obs.).

*Notropis boops* - bigeye shiner: Smith (1979) documented the sporadic distribution and rarity of the bigeye shiner in Illinois and noted that it was probably never abundant in the state except in the Vermilion and Little Vermilion River systems. Burr, et al. (1996) confirmed its abundance in the Little Vermilion River in 1992, collecting the species from several localities downstream of the Georgetown Reservoir. In 1997, the bigeye shiner was taken from site 13 below the reservoir. Two individuals were observed on both 8 July and 22 September 1997.

## Illinois Threatened

*Elliptio dilatata* - spike: The spike has undergone a drastic reduction in its range in Illinois. Formerly present in 20 of the 25 major drainages in the state, it now is thought to exist only in six (Cummings & Mayer 1997). The only known record for *Elliptio dilatata* in the Little Vermilion River was the collection of sub-fossil shells 4 mi SE of Georgetown in 1994. It is likely extirpated from the drainage.

## SUMMARY

The Little Vermilion River historically supported at least 24 mussel species; today 17 are extant in the drainage including two state-listed species, the slippershell and the little spectaclecase. Four listed mussels appear to have been extirpated: spike, kidneyshell, purple lilliput, and rainbow. Five species of crayfishes inhabit the Little Vermilion River, including *Cambarus tenebrosus*, a species with a very limited distribution in Illinois. Fifty-seven species of fishes have been recorded from the Little Vermilion, including three endangered species, the bigeye chub, river chub, and bigeye shiner. All species of fishes recorded from the Little Vermilion probably still occur there, except perhaps the highfin carpsucker. The river chub has not been recorded since 1992, but suitable habitat exists in the Little Vermilion River and the species is likely to be observed there again in the near future.

The vast majority of Illinois fishes and mussels are adapted to life in flowing waters; very few species can survive in lake conditions on impounded streams. Upstream of the Georgetown Reservoir, mussel populations were lowest at sites closest to the reservoir (Table 3, Figure 2). Many factors could be responsible for the paucity of mussels in this region, but the hydrologic alteration of the river resulting from the dam for the Georgetown Reservoir and channelization of upstream areas likely has had a significant negative impact. This view is supported by the contrast between the mussel and fish populations above, near, and below the reservoir. If conditions in the Little Vermilion River are further altered by raising the dam at Georgetown and thereby increasing the portion of the river that is impounded, or by additional channelization of headwater streams, more negative impacts on the stream biota will occur. Because of the distribution of endangered mussels, hydrological alterations near Sidell are especially likely to result in significant losses of endangered species.

The Little Vermilion River is critical for the conservation of aquatic biodiversity and rare mussels and fishes in Illinois. Proposed alterations to the streams should be carefully scrutinized for potential environmental impacts.

## ACKNOWLEDGMENTS

This study was supported by funds provided by the Illinois Wildlife Preservation Fund and administered by the Illinois Department of Natural Resources, Division of Natural Heritage, Springfield. Thanks to Bob Szafoni, Ralph Steinberg, Chris Phillips, John Petzing, Jason Knouft, Rebecca Fuller, and Jon Armbruster for assistance in the field.

## LITERATURE CITED

- Baker, F.C. 1922. The molluscan fauna of the Big Vermilion River, Illinois. With special reference to its modification as the result of pollution by sewage and manufacturing wastes. *Illinois Biological Monographs* 7(2):105-224 + 15 plates.
- Bertrand, W.A., R.L. Hite, and D.M. Day. 1996. Biological Stream Characterization (BSC): Biological Assessment of Illinois Stream Quality through 1993. Illinois Environmental Protection Agency Report No. IEPA/BOW.96-058. December 1996. 40 pages + map.
- Burr, B.M., K.M. Cook, D.J. Eisenhour, K.R. Piller, W.J. Poly, R.W. Sauer, C.A. Taylor, E.R. Atwood, and G.L. Seegert. 1996. Selected Illinois fishes in jeopardy: new records and status evaluations. *Transactions Illinois State Academy of Science* 89(3/4):169-186.
- Burr, B.M., M.L. Warren, Jr., and K.S. Cummings. 1988. New distributional records of Illinois fishes with additions to the known fauna. *Transactions Illinois State Academy Science* 81:163-170.
- Clarke, A.H. 1986. Competitive exclusion of *Canthyria* (Unionidae) by *Corbicula fluminea* (Müller). *Malacology Data Net* 1(1):3-10.
- Cummings, K.S., and C.A. Mayer. 1997. Distributional checklist and status of Illinois freshwater mussels (Mollusca: Unionacea). pp. 129-145 in K.S. Cummings, A.C. Buchanan, C.A. Mayer, and T.J. Naimo, eds. Conservation and management of freshwater mussels II: Initiatives for the future. Proceedings of a UMRCC Symposium, 16-18 October 1995, St. Louis Missouri. Upper Mississippi River Conservation Committee, Rock Island, Illinois. 293 pp.
- Hoeh, W.R. 1990. Phylogenetic relationships among Eastern North American *Anodonta* (Bivalvia: Unionidae). *Malacological Review* 23(1-2):63-82.
- IEPA. 1996. Illinois Water Quality Report (1994-95). State of Illinois, Environmental Protection Agency, Division of Water Pollution Control, Planning Section, Springfield. 241 pp.
- Page, L.M. 1985. The crayfishes and shrimps (Decapoda) of Illinois. *Illinois Natural History Survey Bulletin* 33(4):335-448.
- Page, L.M., and B.M. Burr. 1991. A field guide to freshwater fishes of North America north of Mexico. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

- Page, L.M., B.M. Burr, and K.S. Cummings. 1989. Outstanding aquatic ecosystems within Illinois based on the uniqueness of their fauna and environmental quality. pp. 18-20 in M.A. Phillippi and B.D. Anderson (eds.). Preserving the Aquatic Biodiversity of Illinois: Inventory, Research, Regulation, and Protection. Proceedings of the Illinois Nature Preserves Commission, 25th Anniversary Symposium. 32 pp.
- Page, L.M., K.S. Cummings, C.A. Mayer, S.L. Post, and M.E. Retzer. 1992. Biologically significant Illinois streams. An evaluation of the streams of Illinois based on aquatic biodiversity. Final report prepared for the Illinois Department of Energy and Natural Resources and the Illinois Department of Conservation. Illinois Natural History Survey, Center for Biodiversity Technical Report 1992(1a): v + 485 p.
- Sauer, R. 1989. Biological survey of the Little Vermilion River. Final Report. Illinois Department of Conservation, Division of Fisheries, Streams Program. 9 pp.
- Smith, P.W. 1971. Illinois streams: a classification based on their fishes and analysis of factors responsible for disappearance of native species. Illinois Natural History Survey Biological Notes No. 76. 14 pp.
- Smith, P.W. 1979. The fishes of Illinois. University of Illinois Press, Urbana, Illinois. 314 pp.
- Turgeon, D.D., A.E. Bogan, E.V. Coan, W.K. Emerson, W.G. Lyons, W.L. Pratt, C.F.E. Roper, A. Scheltema, F.G. Thompson, and J.D. Williams. 1988. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. American Fisheries Society, Special Publication 16:viii + 277 p. + 12 pls.
- Warren, M.L., Jr., and B.M. Burr. 1988. Reassessment of the Illinois ranges of the bigeye chub, *Hybopsis amblops*, and the pallid shiner, *Notropis amnis*. Ohio Journal of Science 88(5):181-183.
- Williams, A.B., L.G. Abele, D.L. Felder, H.H. Hobbs, Jr., R.B. Manning, P.A. McLaughlin, and I.P. Farfante. 1989. Common and scientific names of aquatic invertebrates from the United States and Canada. American Fisheries Society Special Publication 17, Bethesda, Maryland. 77 pp.
- Williams, J.D., M.L. Warren, Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. Fisheries 18(9):6-22.