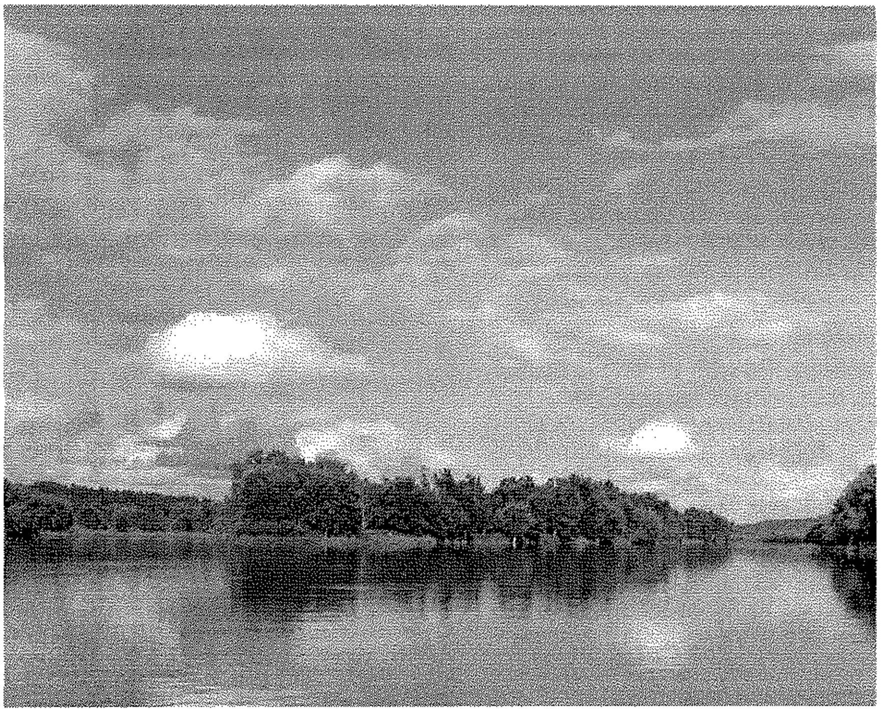
Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Effects of Ammonia on Freshwater Mussels in the St. Croix River


St. Croix River

Freshwater mussels, animals sensitive to changes in habitat quality, are the largest group of endangered animals in North America. Freshwater mussels are a renewable resource that provides significant economic and environmental benefits to the Nation. Their shells are used in the cultured pearl industry; they are a food resource for many animals; and they filter contaminants, sediment, and nutrients from water, thereby improving water quality. Scientists see the mussels' demise as a serious warning for lakes, rivers, and streams. When mussels begin to disappear, it is a sign that other species, and even whole ecosystems, may also be in jeopardy.

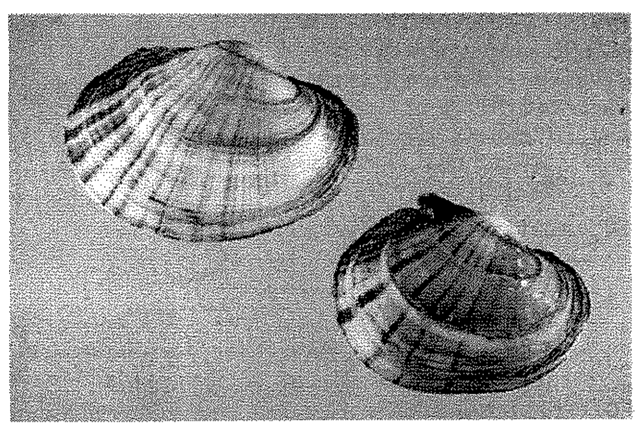
...un-ionized ammonia (NH_3) is particularly toxic to aquatic animals...

The St. Croix River basin (30 km east of Minneapolis-St. Paul, Minnesota) is experiencing rapid land-use changes—from forest and agriculture to suburbanization—as the metropolis of Minneapolis-St. Paul sprawls into the surrounding countryside. The National Park Service, which administers most of the St. Croix, is concerned that urbanization will also increase the output of nutrient-rich effluent from wastewater treatment plants into the river. This may result in an elevation of ammonia in river sediments. Ammonia is a common pollutant that enters rivers primarily from sewage discharge, fertilizers, and natural processes mediated by river bacteria. However, the un-ionized form of ammonia (NH3) is particularly toxic to aquatic animals.

The St. Croix River contains a diverse and abundant group of freshwater mussels. The St. Croix is one of the few rivers in the Midwest not substantially affected by the invasion of the exotic zebra mussel, which encrusts and kills native freshwater mussels. Increased concentrations of ammonia in river sediments, however, poses a significant threat to mussels.

The Upper Midwest Environmental Sciences Center has completed a 3-year study that examined the effects of ammonia on native mussels. We used native mussels because they are considered one of the most important natural resources in the St. Croix River and they are very sensitive to ammonia.

In a series of laboratory studies, juvenile pocketbook mussels (*Lampsilis cardium*) were exposed to a range of ammonia


Pocketbook mussels (Lampsilis cardium) — Photo by Kevin Cummings. Used by permission

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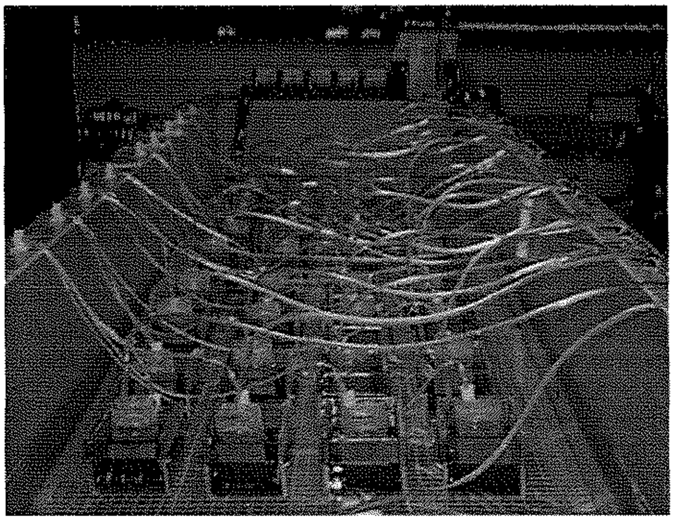
Fact Sheet FS 2004-3046
December 2002

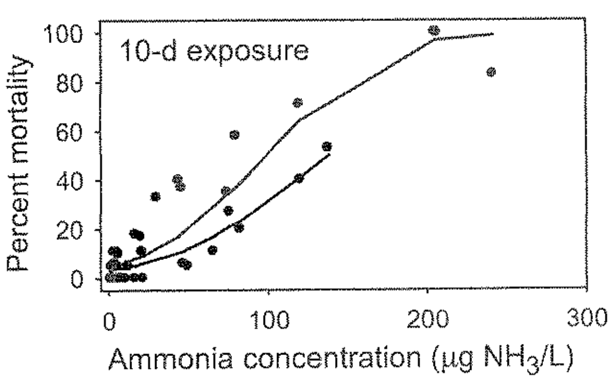


Laboratory setup

concentrations delivered into river sediments. We exposed mussels to ammonia for 4 and 10 days and then measured the concentration of ammonia that killed or reduced the growth of mussels. Concentrations as low as 127 mg NH3/L were lethal to 50% of the mussels after 4 days; concentrations as low as 93 mg NH3/L killed 50% of the mussels after 10 days. The growth rate of mussels was substantially reduced at ammonia concentrations as low as 31 mg NH3/L. These concentrations are lower than the existing national water quality criteria, suggesting that these criteria may not be protecting juvenile mussels.

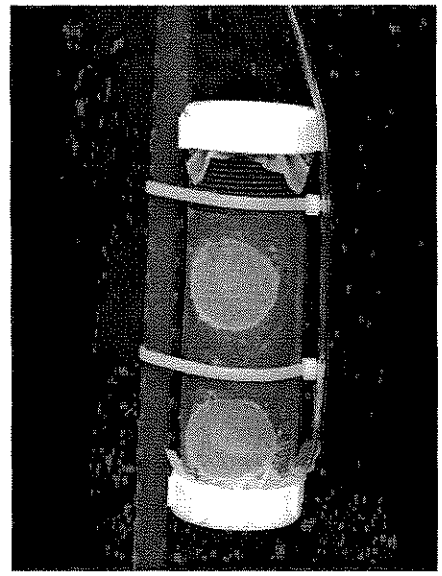
In a companion field study, we placed juvenile pocketbook mussels into small chambers that were placed into river sediment at eight locations throughout the river. After 4, 10, and 28 days, we retrieved the chambers and measured the survival

Elevated concentrations of ammonia in river sediments pose a significant threat to mussels.



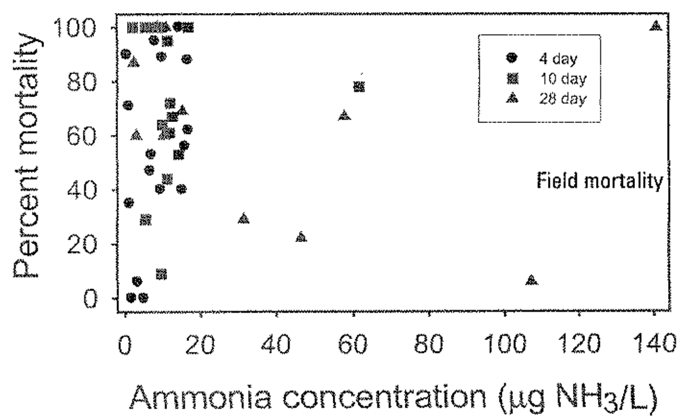
Laboratory mortality

and growth of the mussels. Ammonia concentrations in river sediments ranged from 0.1 to 107 mg NH3/L and were highly variable within a location. Survival and growth of mussels were also highly variable and were generally unrelated to ammonia concentrations. The large variability in the field measures made it difficult to observe a relation between ammonia and survival or growth of mussels.



Mussel chamber

Although freshwater mussels are frequently used as indicators of contaminant exposure, the large variance associated with measuring survival and growth of juveniles in the field suggests that more sensitive effects-level endpoints need to be found in this imperiled faunal group. Laboratory experiments, conducted under highly controlled conditions, suggest that NH3 is quite toxic to juveniles at concentrations that are occasionally exceeded in the St. Croix River. In the river, however, sediments may not be consistently toxic; rather, periods of episodic toxicity may occur when certain conditions (high temperature and low flow) are present.



Field mortality

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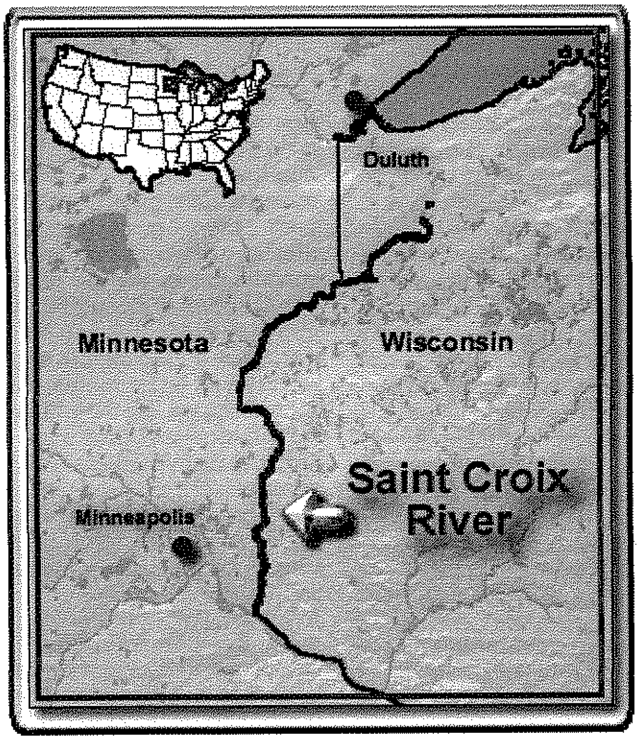
Effects of Ammonia on Unionid Mussels: A Potential Threat to Their Biodiversity in the St. Croix National Scenic Riverway



The St. Croix River Basin is experiencing a rapid change in land use, from forest and agriculture to suburbanization, as the metropolis of Minneapolis-St. Paul, Minnesota, sprawls into the surrounding countryside.

The National Park Service is concerned that increased urbanization will increase the output of nutrient-laden effluent from wastewater treatment plants and other nonpoint sources into the St. Croix River. This could result in elevated levels of ammonia in sediments.

The St. Croix River System contains an extremely abundant and diverse group of freshwater mussels, animals sensitive to changes in habitat quality. Increased concentrations of ammonia in sediments pose a significant threat to these organisms.

We will measure ammonia concentrations in sediments at selected sites along a 90-mile reach of the river and determine if the patterns in ammonia correspond with the distribution patterns of mussels living in these sediments.

Second, we will place juvenile mussels (the most sensitive life stage) at these sites to determine if existing ammonia concentrations adversely affect the survival or growth of the mussels. We will then conduct toxicity tests in the laboratory to determine the lowest concentrations of ammonia that are harmful to juvenile mussels.

We will begin field and laboratory work in spring 2000 and continue through 2001. Results from this project will establish scientifically defensible data for developing management plans. These management plans will minimize nutrient enrichment and help managers predict the effects of increased nutrient concentrations on biota.

The project was completed in September 2001.

Principal Investigator: Teresa Newton

Last updated on July 31, 2003
Contact the Upper Midwest Environmental Sciences Center

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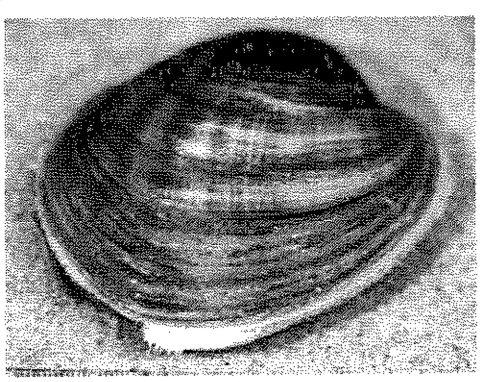
science for a changing world

Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

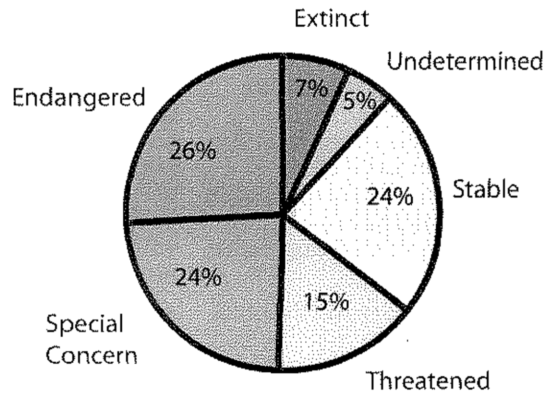
Development of Landscape Models for Conservation of Freshwater Mussels in the Upper Mississippi River Basin

Freshwater mussels are the most imperiled group of animals in North America. About 70% of the 300 native species are considered extinct, endangered, threatened, or of special concern. Freshwater mussels are a renewable resource, providing significant ecological and economic benefits to the Nation. Mussels serve as a food resource for many animals; they improve water quality by filtering contaminants, sediments, and nutrients; and their shells are used in producing cultured pearls. Their declines may be a signal of critical problems in river ecosystems.

Although many threats may be contributing to the declines in species density and diversity, past efforts have not determined which threats are most important. Because freshwater mussels are declining nationwide, it is important to understand what contributes to their distribution (location) and abundance (numbers) across large geographic areas. Much of the research on mussels has been conducted on small streams by teams of mussel specialists measuring traditional habitat variables. Most attempts to predict the distribution or abundance of mussels from variables such as substrate type or water depth have failed when tested critically, suggesting that these measures are inadequate descriptors of mussel communities. Also, many freshwater mussels require a fish host to complete their life cycle. Therefore, management approaches need to maintain the connection between mussels and their host fish. Further advances in understanding mussel populations will probably require a multidisciplinary approach that includes biology, chemistry, and hydrology in both large and small geographic areas.



The Higgins eye (*Lampsilis higginsi*) is one of several freshwater mussel species in the Upper Mississippi River Basin on the Federal endangered species list.



Declines in the number of species and abundance of freshwater mussels have been observed in many large rivers. The Nature Conservancy estimates that 72% of mussel species are vulnerable to extinction or are already extinct.

In 2001, scientists at the Upper Midwest Environmental Sciences Center began to develop predictive models. These computer models relate the distribution of freshwater mussels to physical and biological variables over large and small geographic areas. A geographic information system (GIS) allows scientists to examine the relations among many databases and provides graphical displays of these data. We developed a GIS database on the distribution and abundance of native mussels from eight studies conducted from 1975 to 2001. These studies were conducted in Navigation Pool 8, a 38-km reach of the Upper Mississippi River near La Crosse, Wisconsin. The data from the Pool 8 studies cover 587 locations and provide good geographic coverage throughout the pool, although most locations are near the deepest part of the channel. Of the 587 locations, roughly 60% contained mussels representing 37 species, including the endangered Higgins eye (*Lampsilis higginsi*). Densities of freshwater mussels were highly variable, ranging from 0 to 130 mussels per square meter.

We also assembled a database on physical and biological variables of Pool 8 to compare to mussel distributions. Physical features included land cover in the surrounding area; aquatic area type (e.g., main navigation channel, backwater lake); longitudinal position within the pool; proximity to wing dams, tributaries, and deep holes; and various hydraulic

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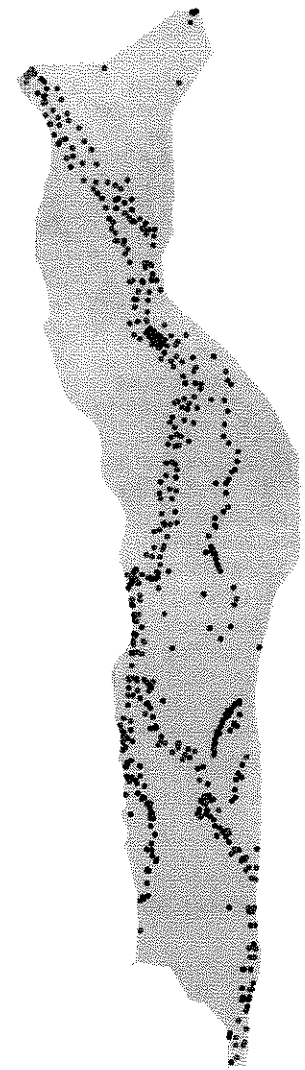
variables. We are also interested in determining if certain biological attributes influence mussel distribution. We grouped mussels into guilds on the basis of breeding strategy, conservation status, commercial status, shell shape, and the number of different fish families that serve as fish hosts. We are now investigating relations among the biological and physical variables and building simple models to generate hypotheses for future research.

Recent analysis suggests that several hydraulic variables may be important in predicting the distribution of mussels. For example, mussels are most often found in areas with a combination of low shear stress (the force exerted by moving water near the river bottom) during periods of high flows and some minimum level of current velocity during low flow periods. Such areas may allow mussels to maintain their position during floods (low shear stress) and still provide adequate food resources, oxygen, and removal of waste products during low water periods. Preliminary analysis shows that three variables–velocity, depth, and shear stress–can predict the presence of mussels 80–96% of the time. Of the 587 locations, however, only about 50 meet the optimal conditions predicted by these models. We don't know whether these conditions are found in unsampled locations or only in a very small percentage of the pool.

Certain biological attributes may also influence the distribution of mussels. For example, thin-shelled species were most common in the upper portion of the pool. The upper portion is more river-like than the lower dammed portion, which is more lake-like. In contrast, those locations dominated by thick-shelled species were evenly distributed throughout the pool. Mussels in the subfamily *Anodontinae* (short-lived, early maturing, rapid growth) were predominately found in the main navigation channel. Mussels in the subfamilies *Lampsilinae* (long-lived, late maturing, slow growth) and *Unioninae* (moderate life span, moderate maturity, and moderate growth) were more widely distributed among other aquatic areas in the pool.

Present analysis focuses on dividing the 587 locations into those with and without juveniles and those with low and high mussel densities. Initially, we will use classification and regression techniques to categorize mussels into groups with similar physical and biological characteristics. We will then develop more detailed analytical models using those variables that seem to influence the distribution of mussels.

We conducted the study using Navigation Pool 8 because the USGS-administered Long Term Resource Monitoring Program provides 15 years of data about physical features (velocity models, depths) and biological components (fish, invertebrates, plants). However, this type of analysis could be done in other data-rich locations at large and small geographic scales and should be broadly applicable throughout other areas such as the Great Lakes region.



Spatial distribution of 587 locations that have been sampled for freshwater mussels in Navigation Pool 8 of the Upper Mississippi River during 1975-2001. About 60% of these locations contained mussels (blue dots) and 40% did not (red dots).

See the project Web page for more information. http://www.umesc.er.usgs.gov/aquatic/native_mussels/5004455.html

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Project Status Report

2000-05

Asian Carp Invasion of the Upper Mississippi River System

by
Todd M. Koel, Kevin S. Irons, and Eric Ratcliff

Five species of Asian carp now occur in the contiguous United States. These include grass carp (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molotrix*), bighead carp (*H. nobilis*) and black carp (*Mylopharyngodon piceus*). Common carp, brought to the United States from Europe in 1831, were soon propagated and distributed throughout waters of the Upper Mississippi River System (UMRS). Grass carp were imported from eastern Asia in 1963 to control submersed aquatic vegetation in aquaculture ponds and were first documented in the Mississippi River along Illinois in 1971. Silver carp and bighead carp were imported from China in 1973 to improve water quality of aquaculture ponds (initially in Arkansas). These species have invaded our Midwestern rivers, through pond escapement or by deliberate introductions and were first documented in the UMRS as early as 1982. Reproducing populations of these four species are now present in the UMRS. Presently black carp, which are mollusk eaters, only exist in aquaculture ponds of Arkansas and Mississippi.

LTRMP documents the spread of Asian Carp Since initiating fish community sampling in 1990, the Long Term Resource Monitoring Program (LTRMP) has been collecting Asian carp from multiple aquatic habitats of six reaches of the UMRS (Figure 1) and documenting changes in abundance and size structure of these potentially harmful fishes. Common carp were abundant thoughout the UMRS long before the LTRMP began. The next species of Asian carp collected by the LTRMP was a 48-cm grass carp taken by electrofishing in September 1990 from the Illinois River, La Grange Reach. Bighead carp were first collected by the LTRMP in 1991 from Pool 26, and silver carp first appeared in our collections in 1998. No Asian carp other than the common carp have been collected from Pools 8 or 13.

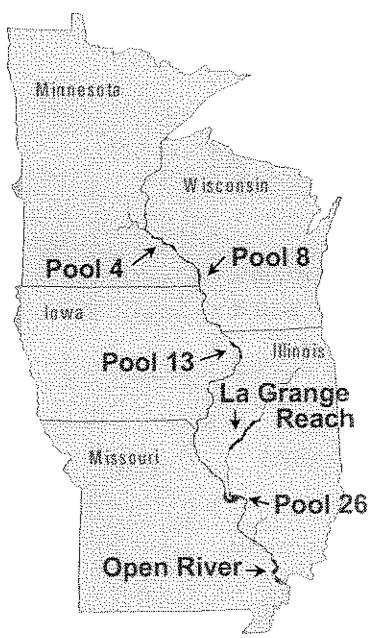

Figure 1. Upper Mississippi River System and locations of Long Term Resource Monitoring Program trend analysis areas.

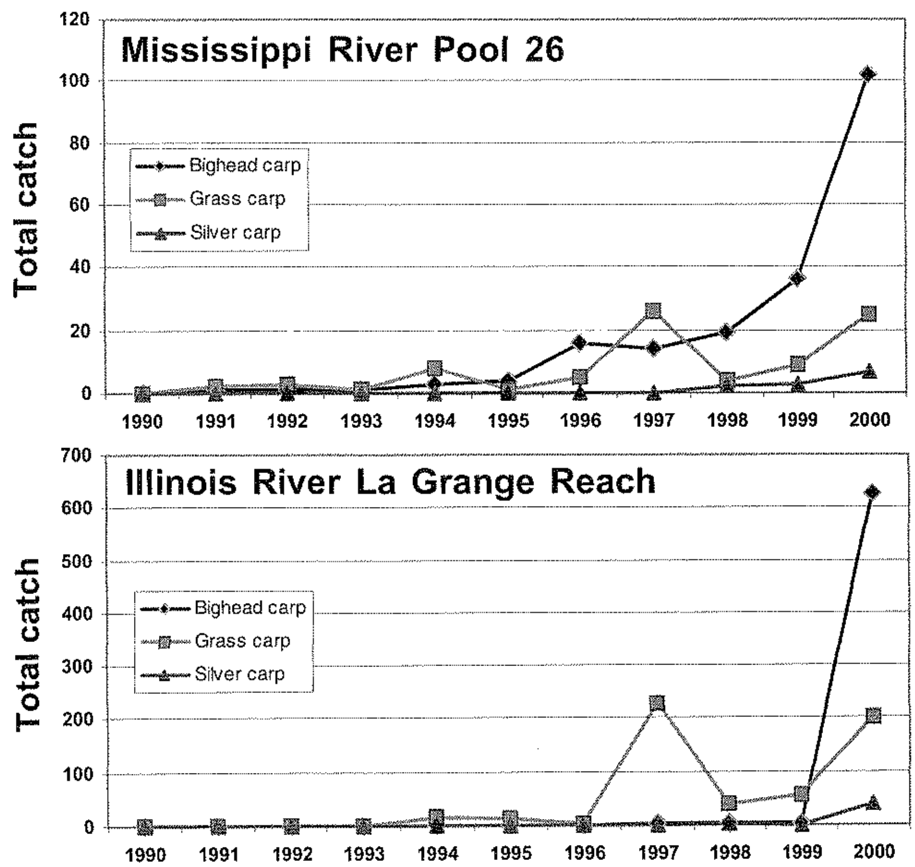

Figure 2. Annual catch of Asian carp collected by the Long Term Resource Monitoring Program from pool 26 of the Mississippi River and La Grange Reach of the Illinois River, 1990-2000. Monitoring during 1990-1999 occurred during June 15 – October 31 of each year. Monitoring in 2000 was done from June 15 to September 15.

Table 1. Total catch and percentage (%) of Asian carp collected by the Long Term Resource Monitoring Program in aquatic habitats of the Upper Mississippi River System, 1990–1999.

Habitat	grass carp		silver carp		bighead carp		all Asian carp	
contiguous backwater open	4	1%	0	0%	59	21%	63	8%
contiguous backwater shoreline	99	21%	1	14%	20	7%	120	16%
impounded open	1	0%	0	0%	12	4%	13	2%
impounded shoreline	7	1%	0	0%	2	1%	9	1%
main channel border unstructured	229	48%	2	29%	74	26%	305	40%
main channel border wing dam	5	1%	1	14%	22	8%	28	4%
side channel border	91	19%	2	29%	53	19%	146	19%
tributary mouth	17	4%	0	0%	33	12%	50	7%
tailwater zone	17	4%	1	14%	1	0%	19	2%
other	3	1%	0	0%	6	2%	9	1%
Total catch 1990 1999	473		7		282		762	

Table 2. Percentage of all Asian carp collected by standard and experimental LTRMP gear, 1990-1999

	Total Length (mm)		
Gear	<200	200-599	>600
Day electrofishing	5%	49%	17%
Experimental trawl	13%	0%	1%
Fyke netting	1%	10%	6%
Gill netting	0%	7%	23%
Hoop netting (large)	0%	15%	42%
Mini-fyke netting	69%	2%	1%
Night electrofishing	0%	9%	3%
Seining	11%	1%	0%
Other	1%	9%	7%

Since 1990, standard and research monitoring (June 15–October 31 annually) by the LTRMP has documented variation and increases in total catch of three recently invading Asian carp species (Figure 2). The total catch of grass carp in 1997 was 26 from Pool 26 and 229 from the La Grange Reach. During June 15–September 15, 2000, we collected 25 grass carp from Pool 26 and 200 from the La Grange Reach. Fewer silver carp have been caught. The catch of silver carp increased from two in 1998 to seven in 2000 at Pool 26, and from two in 1998 to 39 in 2000 in the La Grange Reach. Bighead carp catches from Pool 26 steadily increased from one specimen per year in 1991–1993 to 102 fish during our first two sampling efforts in 2000. In contrast, bighead carp catches from La Grange Reach remained relatively low (0–3 fish per year) through 1999 and then sharply increased to 627 in 2000. Most of these were young-of-the-year or juvenile fish, indicating that this species is reproducing in this reach of the UMRS.

To some extent, we have also noticed species-specific habitat preferences. Catch of all species was highest in unstructured main channel borders (Table 1). However, grass carp catches were also relatively high along contiguous backwater shorelines. Bighead carp catches were also relatively high in contiguous backwater open habitats.

Asian carp are not readily caught with some sampling gears. For example, they are often seen breaking the water surface many meters ahead and along the sides of our electrofishing boats. Asian carp have often entered our boats without the use of dip nets. In fact, many of our staff members have been hit multiple times by large jumping fish. From 1990 to 1999, 69% of Asian carp shorter than 20 cm were collected by mini-fyke netting (Table 2). Asian carp 20 to 60 cm were primarily collected by day electrofishing (49%) and hoop netting (15%). Asian carp larger than 60 cm were primarily collected by hoop netting (42%). These results indicate that multiple sampling gears may be needed for assessing the abundance and size structure of Asian carp populations in our large rivers.

Adverse Effects of Asian Carp Asian carp are becoming abundant and persistent residents of the lower reaches of the UMRS and the Illinois River. We may soon learn whether these large, prolific invaders affect other species and the environmental quality of this river system. On the basis of past experiences (e.g., with common carp), a failure to address the exotic species problem will likely result in more introductions and potential harmful effects to native biota. Monitoring by the LTRMP will be crucial for documenting forthcoming changes to our native riverine fishes because these recent Asian carp invaders are increasing in population and expanding in range.

This report is a product of the Long Term Resource Monitoring Program.

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Project Status Report

2000-04

Native Freshwater Mussels of the Upper Mississippi River System

by
Marian E. Havlik and Jennifer S. Sauer

Native freshwater mussels are one of the most endangered groups of animals in North America. In the United States, 69 of 304 mussel species are listed as federally endangered or threatened. Surveys conducted over the past few decades have documented significant declines in mussel populations across the continent. Among the factors thought to be responsible for the decline are dams, pollution, siltation, commercial navigation, over harvest, and mortality caused by zebra mussel encrustation. Mussels are an important food source for muskrats, raccoons, minks, and bottom-feeding fishes. Commercially, shells of certain native mussel species are made into beads that are inserted into oysters as nuclei for cultured pearls.

Historically, 51 species have been documented in the Upper Mississippi River System (UMRS, which includes Mississippi and Illinois River mainstems), but only 44 species have been documented in surveys conducted within the past 35 years. This loss in species richness may be linked to habitat changes after the locks and dams were built. Nearly all of the species (7) not recently found in the UMRS were considered infrequent inhabitants of the UMRS mainstem by biologists in the late 19th and early 20th century, but were more commonly found in the tributaries of the UMRS.

The current conservation status of UMRS native mussels is summarized in Table 1. This table represents an update to Table 11-1 in the "Ecological Status and Trends of the Upper Mississippi River System 1998: A Report of the Long Term

Table 1. Native mussel species (Order Unionoida) in the Upper Mississippi River System. Unless otherwise noted, species have been found alive in the Mississippi or Illinois Rivers since 1995 (Havlik pers. comm., Yaeger pers. comm.).

E = endangered, **T** = threatened, **SC** = special concern, **X** = extirpated, **CS** = candidate species
TR = not presently in the Mississippi River, but alive in major tributaries of UMRS
^Wisconsin and Iowa treat these two as separate species
#Possibly extirpated from UMRS [1]Year of publication for state and federal listings

Common name	Species	Year of Last Observation	Federal 1999[1]	Illinois 1999[1]	Iowa 1995[1]	Minnesota 1996[1]	Missouri 1999[1]	Wisconsin 1997[1]
Subfamily Cumberlandinae								
Spectaclecase	*Cumberlandia monodonta* (Say, 1829)			E	E	T	SC	E
Subfamily Ambleminae								
Threeridge	*Amblema plicata* (Say, 1817)							
Purple wartyback	*Cyclonaias tuberculata* (Rafinesque, 1820)	1991		T	T	T		E
Elephantear	*Elliptio crassidens* (Lamarck, 1819)	1977		T		E	E	E
Spike	*Elliptio dilatata* (Rafinesque, 1820)			T		SC		
Ebonyshell	*Fusconaia ebena* (I. Lea, 1831)			T		E	E	E
Wabash pigtoe	*Fusconaia flava* (Rafinesque, 1820)							
Washboard	*Megalonaias nervosa* (Rafinesque, 1820)					T		SC
Sheepnose	*Plethobasus cyphyus* (Rafinesque, 1820)			E	E	E	E	E
Round pigtoe	*Pleurobema sintoxia* (Rafinesque, 1820)				E	T		SC
Winged mapleleaf (TR)	*Quadrula fragosa* (Conrad, 1835)	1921	E			E	E	E
Monkeyface	*Quadrula metanevra* (Rafinesque, 1820)					T		T
Wartyback	*Quadrula nodulata* (Rafinesque, 1820)					E	SC	T
Pimpleback	*Quadrula p. pustulosa* (I. Lea, 1831)							
Mapleleaf	*Quadrula quadrula* (Rafinesque, 1820)							
Pistolgrip	*Tritogonia verrucosa* (Rafinesque, 1820)				E	T		T
Pondhorn (TR)	*Uniomerus tetralasmus* (Say, 1831)	1919						
Subfamily Anodontinae								
Elktoe	*Alasmidonta marginata* Say, 1818					T	SC	SC
Slippershell mussel (TR)	*Alasmidonta viridis* (Rafinesque, 1820)	1883		T	E			T
Flat floater	*Anodonta suborbiculata* Say, 1831						SC	SC
Cylindrical papershell (TR)	*Anodontoides ferussacianus* (Lea, 1834)	1883			T		SC	
Rock pocketbook	*Arcidens confragosus* (Say, 1829)					E	SC	T
White heelsplitter	*Lasmigona c. complanata* (Barnes, 1823)							
Creek heelsplitter	*Lasmigona compressa* (I. Lea, 1829)	1979			T	SC		
Flutedshell	*Lasmigona costata* (Rafinesque, 1820)					SC		
Giant floater	*Pyganodon grandis* (Say, 1829)							
Salamander mussel	*Simpsonaias ambigua* (Say, 1825)	1982		E		T	SC	T
Creeper	*Strophitus undulatus* (Say, 1817)				T			
Paper pondshell	*Utterbackia imbecillis* (Say, 1829)							

Table 1 (continued from front side)

Subfamily Lampsilinae

		Year of Last Observation	Federal 1999[1]	Illinois 1999[1]	Iowa 1995[1]	Minnesota 1996[1]	Missouri 1999[1]	Wisconsin 1997[1]
Mucket	*Actinonaias ligamentina* (Lamarck, 1819)					T		
Butterfly	*Ellipsaria lineolata* (Rafinesque, 1820)			T	T	T		E
Snuffbox (TR)	*Epioblasma triquetra* (Rafinesque, 1820)	1920		E		T	SC	E
Plain pocketbook	*Lampsilis cardium* Rafinesque, 1820							
Higgins eye	*Lampsilis higginsii* (I. Lea, 1857)		E	E	E	E	E	E
Fatmucket	*Lampsilis siliquoidea* (Barnes, 1823)							
^Yellow sandshell	*Lampsilis teres anodontoides* (Lea, 1831)				E	E		E
^Slough sandshell	*Lampsilis teres teres* (Rafinesque, 1820)				E			E
Fragile papershell	*Leptodea fragilis* (Rafinesque, 1820)							
#Scaleshell (TR)	*Leptodea leptodon* (Rafinesque, 1820)	1921	CS				SC	X
Black sandshell	*Ligumia recta* (Lamarck, 1819)			T		SC	SC	
Pondmussel	*Ligumia subrostrata* (Say, 1831)	1968						
Threehorn wartyback	*Obliquaria reflexa* Rafinesque, 1820							
Hickorynut	*Obovaria olivaria* (Rafinesque, 1820)					SC	SC	
Pink heelsplitter	*Potamilus alatus* (Say, 1817)							
#Fat pocketbook	*Potamilus capax* (Green, 1832)	1986	E	E			E	X
Pink papershell	*Potamilus ohiensis* (Rafinesque, 1820)							
Bleufer	*Potamilus purpuratus* (Lamarck, 1819)	1975						
Lilliput	*Toxolasma parvus* (Barnes, 1823)							
Fawnsfoot	*Truncilla donaciformis* (I. Lea, 1828)							
Deertoe	*Truncilla truncata* Rafinesque, 1820							
Ellipse (TR)	*Venustaconcha ellipsiformis* (Conrad, 1836)	1930			T	T		T

For more information on native mussels see: http://www.inhs.uiuc.edu/chf/pub/mussel_man/cover.html
http://www.umesc.usgs.gov/reports_publications/status_and_trends.html

Resource Monitoring Program." In the table, we have included all 51 species of mussels historically found in the UMRS. The conservation status of native mussels varies from state to state. Each state describes the status of a species population only within that particular state, not the UMRS as a whole. It is often difficult to interpret such a table because of the different definitions of the conservation status for each species and the variability in ranking procedures among the states.

Some species in Table 1 are not presently found in the UMRS mainstem. Species such as scaleshell and slippershell have usually been found in UMRS tributaries but only rarely in the UMRS itself. In 1913, upstream from Lock and Dam 19, mussel composition changed in part because some fishes that are obligatory hosts for mussels could not migrate past the dam. Other navigation dams built in the 1930's also affected mussels by changing the character of the river. The percent abundance of many mussel species has changed especially in pooled portions upstream of dams. For instance, the threeridge mussel is now the most abundant mussel species in the UMRS. The ebony shell (formerly composing 80% of the mussel fauna) and elephantear almost disappeared from the UMRS because populations of their primary host fish—the skipjack herring—declined sharply. Populations of other species such as the washboard, mapleleaf, flat floater, and lilliput mussels have increased in the pooled portions of the river.

Forty-four mussel species still exist in the UMRS proper and an additional 7 species survive in the immediate tributaries (within 100 miles of the UMRS). These include winged mapleleaf, snuffbox, ellipse shell, and cylindrical papershell. The UMRS and tributaries contain three species that are federally endangered (winged mapleleaf, Higgins eye, and fat pocketbook), and one species presently under federal review (scaleshell).

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