BIOASSESSMENT IN THE TIPPECANOE RIVER WATERSHED

2003 AND 2004

Final Report

Prepared for:

The Nature Conservancy-Indiana Chapter

By:

Commonwealth Biomonitoring
8061 Windham Lake Drive
Indianapolis, Indiana 46214

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Acknowledgements

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I. Introduction

Because of its high biodiversity, the Tippecanoe River has been designated as a high priority for conservation by The Nature Conservancy of Indiana. Previous mussel surveys (Cummings et al., 1992; Ecological Specialists, Inc., 1993) have shown that the Tippecanoe River is a valuable mussel resource, being home to many species, including some listed as federally endangered. Fish diversity is also high. A fish survey by Carney et al. (1993) yielded 68 species, including a number that are rare or declining throughout their historic ranges.

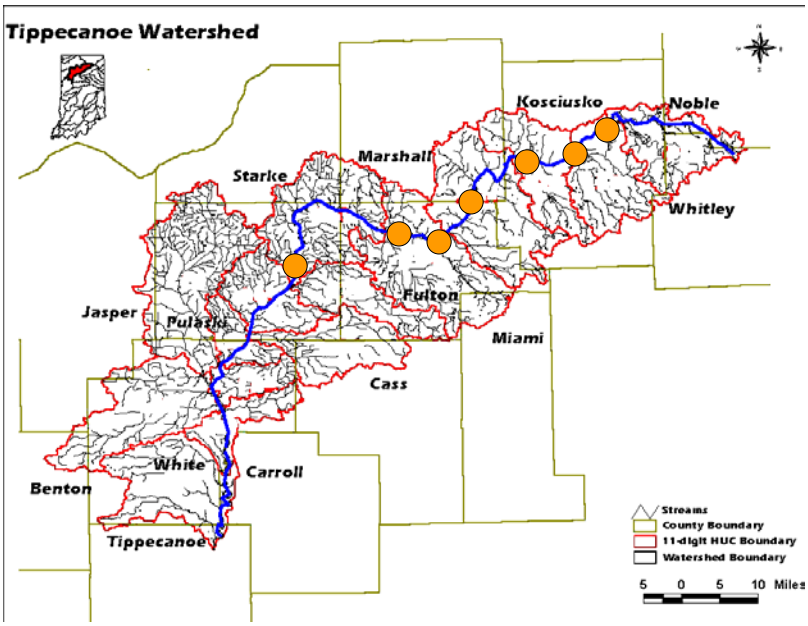
The Tippecanoe River has its origins in Noble and Whitley Counties and drains 1950 square miles (Hoggatt, 1975) in northern and central Indiana before joining the Wabash River in Tippecanoe County. Land use is primarily agricultural, although several urban areas (Warsaw, Rochester, Winamac) are within the watershed.

Study sites

Seven bioassessment sites were evaluated (Figure 1). These sites had been surveyed previously in 2000 and 2001 (Midwest Biodiversity Institute, 2002). Location of sites were:

Site 1 CR 175 E Bridge, Kosciusko County
Site 2 CR 300 N Bridge, Kosciusko County
Site 3 CR 650 W Bridge (near Atwood), Kosciusko County
Site 4 Talma public access site, Fulton County
Site 5 Menominee public access site (near Rochester), Fulton County
Site 6 CR 375 W bridge (Germany Bridge), Fulton County
Site 7 Public access site off US 35 (near Winamac), Pulaski County

Figure 1. Location of bioassessment sites. Sites are numbered from 1 to 7, with 1 being the most upstream.



II. Methods

The following methods apply to both 2003 and 2004 collections, with the exception of the river-length mussel survey, which was only done in 2004. All raw data was entered in Microsoft Excel (see Appendices).

1. Fish

1a. Field collections

Fish were collected by electrofishing for a minimum collection time of 2400 seconds. Fish were identified on site before being released, except for representative specimens that were kept as vouchers. Small cyprinids were preserved in formalin for laboratory analysis. Any anomalies present on the fish were noted.

1b. Laboratory analysis

Preserved fish were identified using the taxonomic references of Eddy and Underhill (1978) and Page and Burr (1991). Index of Biotic Integrity (IBI) scores were calculated according to the method of Karr et al. (1986) and Simon and Dufour (1997).

2. Mussels

2a. Seven Bioassessment Sites

At each site, a river length of 1000 meters was surveyed. Field personnel searched for mussels and shells by wading and snorkeling. Both visual and tactile searches were used. Shells were categorized as fresh dead or weathered dead, depending on the condition of the periostracum (outer shell covering) and whether the hinge ligament was still attached. Very old shells that were chalky were classified as sub-fossil. Because some live mussels were burrowed in the substrate just below the surface, probing with fingers was used to locate them. All live mussels were identified on site, measured for length, and returned immediately to the substrate. Photographs were taken of representative species. The condition and numbers of shells were noted, including whether they were single valves or attached at the hinge ligament.

2b. River-length survey.

Sites were chosen in areas with current that were accessible by wading. Each site was searched with visual and tactile methods for a minimum of 0.5 person-hours. Live mussels were identified on site, measured, and immediately returned to the substrate. A species list of shells and their conditions was compiled for each site. Some tributaries were also examined to see if there were any signs of mussel life and/or suitable habitat.

3. Macroinvertebrates

3a. Field collections

At each of the seven bioassessment sites, a Hester-Dendy artificial substrate sampler was set during a period of relatively low flow. Macroinvertebrates were allowed to colonize on the sampler for a period of eight weeks, after which time the samplers were retrieved. Specimens were scraped from the surface of the artificial substrate and preserved with 70% isopropanol until laboratory analysis. A separate qualitative sample using a dip net

was also taken at the time of Hester-Dendy retrieval. This sample was also preserved with 70% isopropanol until laboratory analysis.

3b. Laboratory Analysis
Macroinvertebrates were sorted from debris in the samples by hand-picking while using a magnification lens. A 250 organism sub-sample was then identified to the lowest practical taxonomic level using standard references (Merritt and Cummins, 1996; Schuster and Etnier, 1978; Simpson and Bode, 1980). A macroinvertebrate biotic index was calculated using the methods of Ohio EPA (1987). The maximum value with this method is 60. To facilitate comparison with habitat scores, scores were standardized to maximum score of 100. Voucher specimens will be deposited at the Purdue University Entomology Department.

4. Habitat Evaluation
Habitat was evaluated using the Ohio EPA method. This method scores seven habitat parameters for a maximum score of 100.

III. Results
1.Fish
1a. Species diversity:
A total of 55 fish species was collected during the two-year study. Species represented by only one specimen include white crappie, blue catfish, stonecat, longnose gar, golden shiner, streamline chub, gilt darter, and creek chubsucker. The most common families were Centrachidae and Cyprinidae (Figure 2). The number of fish species per site ranged from 16 to 30 (Figure 3). A complete listing of fish data by site can be found in the appendix.
Figure 2. Overall fish community composition for 2003 and 2004.

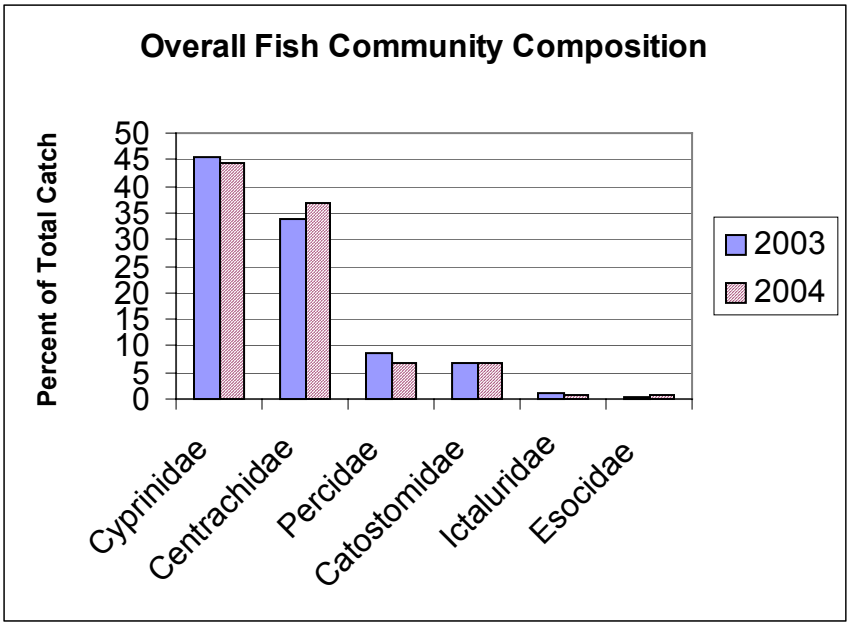
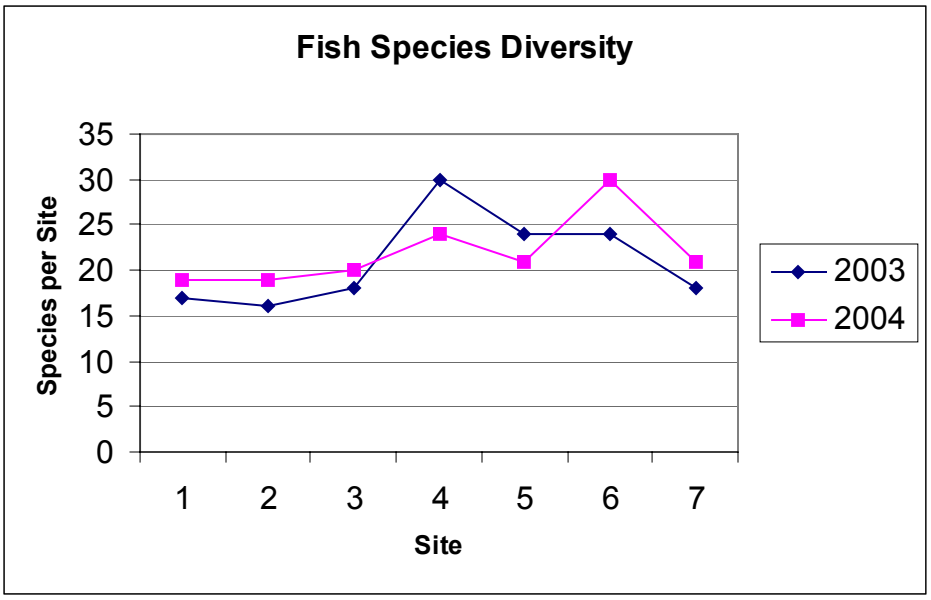


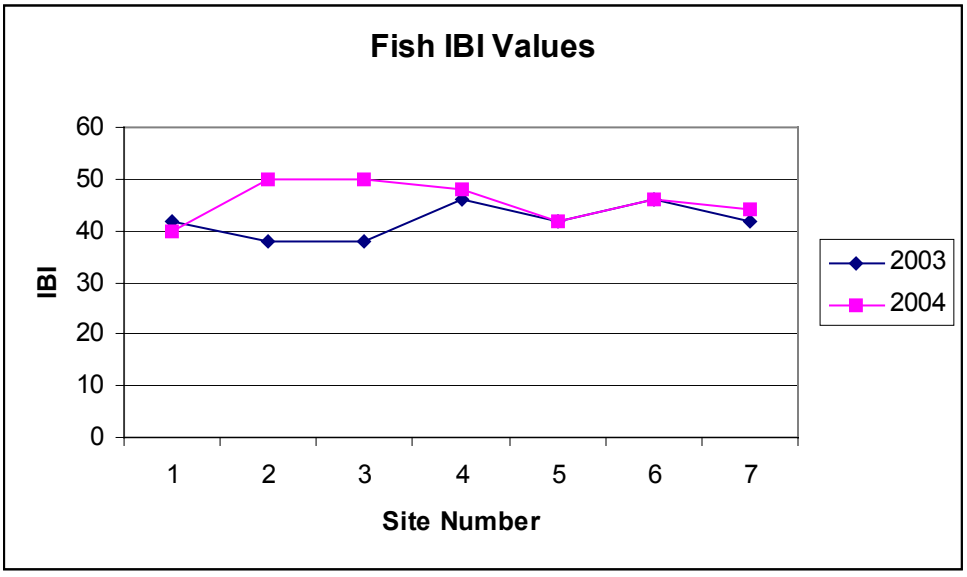
Figure 3. Number of fish species collected per site for 2003 and 2004.



1b. Fish IBI values

Fish IBI are shown in Figure 4. Values for 2003 ranged from 38 to 46, all in the "fair" category. The lowest scores (38) were at sites 2 and 3. Sites 4 and 6 had the best scores (46). In 2004, sites 1 through 4 were in the "good" category, while the others were "fair".

Figure 4. Fish IBI values by site for 2003 and 2004.

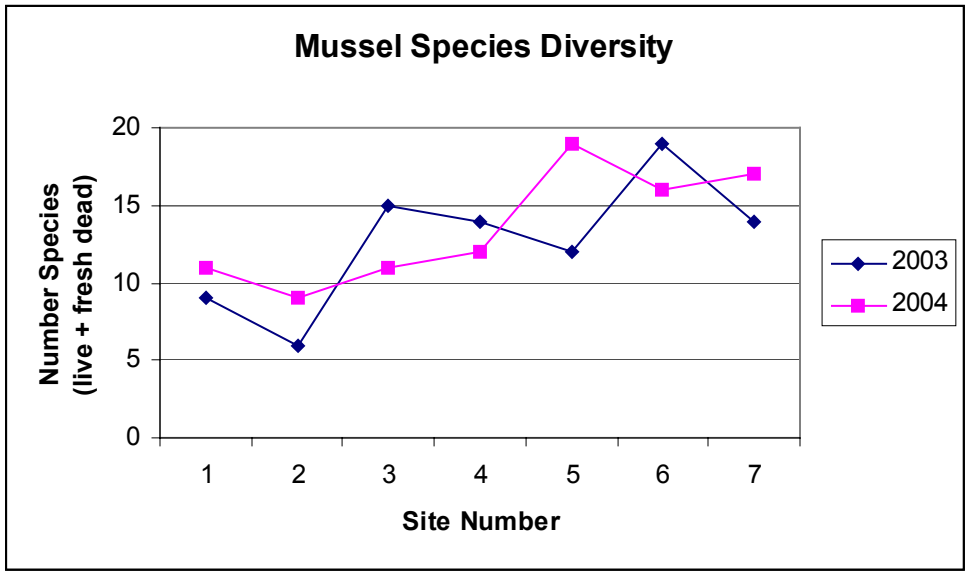


2. Mussels

2a. Species diversity

Shells and live mussels representing 34 species were found during the study. However, four species (*Epioblasma rangiana, Ligumia recta, Pleurobema plenum,* and *P. rubrum*) were only evident as a few weathered dead or sub-fossil valve fragments. Figure 5 shows the number of live and fresh dead species at the seven bioassessment sites for 2003 and 2004. A complete listing of species data can be found in the appendix.

Figure 5. Mussel species diversity by site for 2003 and 2004.



2b. Species accounts

Actinonaias ligamentina (mucket): Mucket was widely distributed throughout the river, although it was most abundant downstream from the Marshall/Fulton County line in areas of suitable substrate. In 2003, mucket was found live or fresh dead at all but the two most upstream sites.

Amblema plicata (threeridge): Threeridge is a generally common species state-wide, but was not found alive during this survey. It probably is living in low numbers in the Tippecanoe River, as evidenced by the occurrence of fresh dead shells.

Alasmidonta marginata (elktoe): Elktoe was widely distributed, but not abundant. At the seven bioassessment sites, three were found live in 2003, and five in 2004.

Alasmidonta viridis (slippershell): Slippershell is a headwater species, and no live individuals were found in the Tippecanoe River. A few fresh dead shells were found, but it is likely that these were carried in by the current from tributaries.

Anodontoides ferussacianus (cylindrical papershell): Cylindrical papershell is another headwater species. One weathered dead partial valve was found in Chippewamuck Creek, and one fresh dead valve at Atwood.

Cyclonaias tuberculata (purple wartyback): Purple warty back is a species that is considered generally uncommon in the Midwest. At the seven bioassessment sites, it was the 3rd most abundant of live mussels in both 2003 (13%) and 2004 (10%). During the river-length survey, it was found live at seven sites, and fresh dead at 13 more. Young mussels less than 2 inches in length were observed, indicating that this species is reproducing.

Elliptio dilatata (spike): Fresh dead shells of this species were widely distributed throughout the river, however, only one live individual was found during each of the 2003 and 2004 surveys.

Epioblasma rangiana (northern riffleshell): One sub-fossil valve fragment was found upstream from site 2. This species is unlikely to be living in the Tippecanoe River.

Fusconaia flava (Wabash pigtoe): Wabash pigtoe was widely distributed throughout the study area. Of the seven bioassessment sites, it was the second most abundant in both 2003 (19%) and 2004 (17%). In the river-length survey, it was live at 15 sites, and fresh dead at 10 more sites. Juveniles were observed in both 2003 and 2004, indicating that this species is reproducing.

Lampsilis cardium (plain pocketbook): This species was distributed evenly, but was never found in great numbers. At the seven bioassessment sites, there were 12 live (5%) in 2003 and 11 live (3%) in 2004. In the river-length survey, live plain pocketbooks were found at seven sites, but only one individual at each site. No juveniles were of this species were seen.

Lampsilis fasciola (wavy-rayed lampmussel): Cummings and Mayer (1992) list wavy-rayed lampmussel as a widely distributed but uncommon species in the northern tributaries of the Ohio River. Watters (1995) states that it is only found in good quality streams. Only three live individuals of this species were found during the entire study. The occurrence of live mussels and fresh dead shells was restricted to the portion of river from Rochester upstream.

Lampsilis siliqoidea (fatmucket): No live mussels of this species were collected from the Tippecanoe River, but a few fresh dead shells were widely distributed throughout. A common and often dominant species in small streams, this mussel is less likely to be very abundant in larger rivers.

Lasmigona complanata (white heelsplitter): There was no evidence of white heelsplitters upstream from Rochester. Only seven live individuals were found during the entire study, although fresh dead shells were found frequently.

Lasmigona compressa (creek heelsplitter): One live mussel was found near Rochester, along with a few shells. This is typically a small stream species, being found rarely in large rivers.

Lasmigona costata (fluted shell): This species was not found upstream from Warsaw, but was widely distributed downstream. Live mussels of this species were never fond in great groups, but rather one or two at a time. No juveniles were seen.

Ligumia recta (black sandshell): This species was represented by a few weathered valves. It is doubtful whether it still lives in the Tippecanoe River.

Obovaria subrotunda (round hickorynut): Round hickorynot was an uncommon species. Only two live mussels were found each year. Shells were widely scattered and showed no clear distributional pattern.

Plethobasus cyphyus (sheepnose): Sheepnose was only found (as shells or live) from the Talma area downstream. Live mussels and fresh dead shells were widely distributed. A small (2.5 inches long) mussel was found at Haschell Bridge (Pulaski County Road 250). By counting annual rings, it was estimated that this individual was five years old.

Pleurobema clava (clubshell): Shells were widely distributed throughout the river, although very few live mussels were found. Its habit of burrowing into the substrate makes finding live clubshells more unlikely.

Pleurobema coccineum (round pigtoe): Round pigtoe was a fairly common species, with live animals and fresh dead shells widely distributed throughout the river.

Pleurobema rubrum (pyramid pigtoe): Represented by one weathered dead valve, this species is most likely extirpated from the Tippecanoe.

Pleurobema plenum (rough pigtoe): Four sub-fossil valves were found. This species is also most likely extirpated from the Tippecanoe.

Ptychobranchus fasciolaris (kidneyshell): This species was widely distributed throughout the river. Eighteen live mussels were found during the 2003 survey; seven during the 2004 survey. Live kidneyshells and fresh dead shell were most numerous at the upstream bioassessment site.

Pyganodon grandis (giant floater): The typical habitat of this species is mud in areas of low current. Shells were seen throughout the river. The most live (5) in a group were located in an area protected from strong currents, immediately downstream from an island at Talma.

Quadrula cylindrica (rabbitsfoot): This species is uncommon and may be in decline. Only three live mussels of this species were found during the entire study. Two of these

were old (5 and 4.5 inches long) specimens. Only one younger (2.5 inches long) mussel was seen. Most of the shells encountered were weathered dead.

Quadrula pustulosa (pimpleback): Pimpleback was the most abundant species, representing 18% (2003) and 41% (2004) of all live mussels at the seven bioassessment sites. It occurs from Atwood downstream and is widely distributed. Juveniles were often seen, indicating that this species is stable.

Quadrula quadrula (mapleleaf): Two fresh dead valves were found downstream from Monterey. This species is more abundant in Lake Freeman and the lower Tippecanoe River (personal observation), beyond the area of the current study.

Simpsonaias ambigua (salamander mussel): One valve was found at the Highway 17 bridge (Fulton County). This species is unusual in that its host is the mudpuppy and has a preference for living under rocks (Watters, 1995).

Strophitus undulatus (creeper): This species is listed as widespread and common by Cummings and Mayer (1992). Fresh dead shells were widely distributed, but few (1 in 2003, 3 in 2004) live mussels were found. Watters (1995) reports that it can tolerate a wide range of stream sizes and environmental conditions.

Toxolasma lividus (purple lilliput): This was a very rare species in this study. One valve was found in 2003 at Germany Bridge.

Toxolasma parvus (lilliput): No live mussels of this species were found, but fresh dead shells were found in three locations. This small (length up to 1.5 inches) mussel is listed as widespread and locally abundant by Cummings and Mayer (1992).

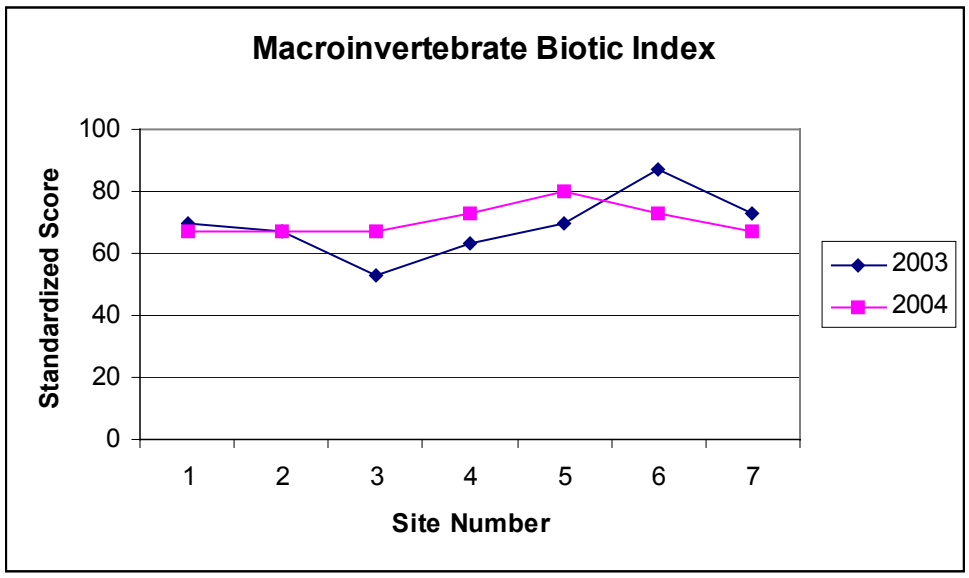
Uniomerus tetralasmus (pondhorn): One weathered dead valve was found at Rochester in 2004. The typical habitat of this species is muddy substrates in ponds or small streams.

Utterbackia imbecillis (paper pondshell): This thin-shelled species is not typically found in areas with strong current. However, one (2003) and 2 (2004) live of this species were found in main channel areas of the river.

Villosa iris (rainbow): Fresh dead shells of this species were widely distributed throughout the river, although only one live mussel was found, at the upstream bioassessment site.

3. Macroinvertebrates
All standardized macroinvertebrate biotic indices (Figure 6) scored in the "excellent" category, except for site 3 in 2003, which scored as "good". A complete listing of macroinvertebrate data can be found in the appendix.

Figure 6. Macroinvertebrate biotic index scores for 2003 and 2004.



4. Habitat
Habitat scores ranged from 81 to 88. All sites have excellent habitat integrity.

IV. Conclusions
The Tippecanoe River is a valuable resource and should remain a high priority for conservation. The habitat is excellent and should be protected. Macroinvertebrate communities are consistent with good water quality. However, one of the fish IBI metrics could indicate developing problems. The percentage of simple lithophils (fishes that need clean gravel beds for spawning) was lower than what would be expected. Turbidity and siltation were observed during the course of this study, and could be contributing to the decline of simple lithophilic fishes.

Mussel diversity and abundance was excellent. The distribution of mussels observed during the river-length survey was patchy and seemed to be determined by substrate composition. Several stretches of river were largely sand bottom, and few mussels or shells were seen. Areas of stable sand/gravel substrate nearby supported thriving mussel beds. The exception to this was at site 2, where no live mussels and few shells were found in 2004, despite areas of good substrate. In 2003, a few live mussels were found at this site, although it had the lowest diversity and abundance of mussels. *Dreissena polymorpha* (zebra mussel) was most abundant at Site 1, where it was observed encrusting unionid shells.

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