FINAL REPORT

AUG 2 4 2001

1999 Project Abstract
For the Period Ending June 30, 2001

TITLE: Mussel Resource Survey
PROJECT MANAGER: Mike Davis
ORGANIZATION: MN DNR
ADDRESS: 1801 South Oak St, Lake City, MN 55041
WEB SITE ADDRESS: www.dnr.state.mn.us
FUND: Trust Fund
LEGAL CITATION: ML 1999, [Chap.231], Sec.[16], Subd. 15(a) Mussel Resource Survey

APPROPRIATION AMOUNT: $400,000.00

Overall Project Outcome and Results:
Surveys of Minnesota's river systems were the focus of this project. Altogether, 886 sites were sampled in 32 rivers, 64 tributaries and 12 lakes. Surveys were completed on 28 rivers. Forty river systems remain incomplete. Field work began July 28,1999 and continued through June 28, 2001.

Of Minnesota's 47 previously known mussel species, 12 were not collected during this effort. Although historic ranges were sampled for nine of these, they were not found. A species new to Minnesota, *Ligumia subrostrata* (pondmussel), was discovered in the Missouri River drainage.

Rivers within the St. Croix and Lake Superior drainages retain their historic complement of mussel species. Tributaries of the Minnesota River have lost about 50% of theirs. River basins predominantly devoted to row crops have the poorest mussel populations and species richness. Notable exceptions are Otter Creek in Mower County, which retains its historic species and is the only stream in Minnesota's Southern tier of counties supporting the state Threatened *Actinonaias ligamentina* (mucket), and Rose Creek, also in Mower County, which supports a healthy population of *Elliptio dilatata* (spike), a Special Concern species nearly extirpated from most of its historic state range. Recovering populations of mussels were documented in Pools 1-3 of the Mississippi River. This information can be used to understand historic impacts and gauge the future success of watershed restoration work

Project Results Use and Dissemination:
A poster, Mussels of Minnesota, has been produced and 3,000 copies distributed. An article in the Minnesota Volunteer appeared in the July/August 2000 edition. Information about this project and the mussels of Minnesota can be found on the DNR website. Two thousand lots of shells have been deposited in the Bell Museum of Natural History creating a permanent record of mussel distribution in the state. Data collected is being managed in the DNR Natural Heritage Information System.

Date of Report: July 1, 2001
Project Completion Date: June 30, 2001

AUG 2 4 2001

LCMR Work Program Final Report 1999
I. Project Title: Mussel Resource Survey
Project Manager: Mike Davis
Affiliation: MN DNR
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Telephone Number: (651) 345-3331 **E-Mail:** mike.davis@dnr.state.mn.us **Fax:** (651) 345-3975
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***Total* Biennial Project Budget:**	$400,000.00		
$LCMR:	$400,000.00	**$Match:**	none
-$LCMR Amount Spent (3/01):	$400,000.00	**-$Match Amount Spent:**	____
=$LCMR Balance:	$0.00	**= $Match Balance:**	

A. Legal Citation: ML 1999, [Chap.231], Sec.[16], Subd. 15(a) Mussel Resource Survey
$200,000 the first year and $200,000 the second year are from the trust fund to the commissioner of natural resources for the first biennium of a three-biennium project to survey mussels statewide for resource management.

B. Status of Match Requirement: Not required.

II and III. Final Project Summary

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IV. OUTLINE OF PROJECT RESULTS:

Result 1: Prioritization:

Preexisting survey data and information from mussel experts have been compiled in coordination with staff at the University of Minnesota Bell Museum of Natural History. Completed stream surveys have been mapped to aid in visualization of streams or stream segments that remain to be surveyed and were used to prioritize the streams surveyed during this biennium.

LCMR Budget:	$ 17,384	Match: $ 0
Balance (July 1, 2001):	$ 0	
Completion Date: June 30, 2000		

Result 2: Field Inventory:

Field surveys of Minnesota's rivers and their tributary streams have been the primary focus of this project. In total, 886 sites were sampled on 32 rivers, 64 tributaries and 12 lakes. Surveys were completed on 28 rivers. Work completed during this project leaves 36 rivers and their tributaries unsurveyed and four rivers with incomplete surveys. Field work began July 28,1999 and continued through June 28, 2001. Surveys in the St. Croix River and Missouri River drainages were completed. Nearly completed were surveys of tributaries to the Mississippi River below St. Anthony Falls and the Lake Superior drainage. Partially completed are the rivers within the Minnesota and Red River drainages. Little or no survey work was done in the Mississippi headwaters region, Mississippi River upstream of St. Anthony Falls, Mississippi River mainstem below Pool 3, the Red River mainstem, or in the Lake of the Woods/Rainy River basin.

Of Minnesota's 47 previously known mussel species, 12 were not collected during this effort. Of these 12, two were considered extirpated from the state prior to this effort (*Proptera capax* (fat pocketbook) and *Leptodea leptodon* (scaleshell), one has never been reported from the areas surveyed by this project (*Anodonta suborbiculata* (flat floater). Although areas within their historic range were sampled during this project, seven species, (*Cumberlandia monodonta* (spectaclecase, *Epioblasma triquetra* (snuffbox), *Tritigonia verrucosa* (pistolgrip), *Simpsonaias ambigua* (salamander mussel), *Fusconaia ebena* (ebonyshell), *Quadrula fragosa* (winged mapleleaf) and *Elliptio crassidens* (elephant ear)) were not collected alive, but are known to still survive in small portions of their former Minnesota range (primarily in the St. Croix River mainstem). Although two individuals of *Plethobasus cyphyus* (sheepnose) have been collected alive within the last decade, it was not found during this survey. One species, *Lampsilis teres* (yellow sandshell), has not been collected alive in Minnesota for several decades and was not collected during this survey. It is possible that these two species have been extirpated from Minnesota. One species, *Ligumia subrostrata* (pondmussel), that was previously not reported

from Minnesota was discovered alive in the Missouri River drainage,. More than 2000 lots of shells collected during this survey have been deposited at the University of Minnesota, James Ford Bell Museum of Natural History, and support was provided to the University to insure that the speciemens were processed in a timely manner. Data collected are being added to the Natural Heritage Information System where they will be available in tabular and GIS formats for a variety of uses.

In general, rivers within the St. Croix River and Lake Superior drainages retain their historic complement of mussel species, rivers that are tributaries of the Mississippi River below Kellogg, MN has lost about 30% of their native species, and tributaries of the Minnesota River have lost about 50% of theirs. Rivers whose basins are predominantly devoted to row crops have the smallest mussel populations and species richness, even though some of these historically had both high numbers of mussels and up to 30 native species. The Shell Rock, Blue Earth and Chanarabie (a tributary of the Rock River) Rivers stood out as examples of particularly damaged or degraded streams. A few streams in the agricultural region of the state were discovered during this survey to have surprisingly intact mussel faunas. Otter Creek in Mower County still retains its historic complement of species. It is the only stream in Minnesota's Southern tier of counties that still supports the state Threatened *Actinonaias ligamentina* (mucket), a species once abundant in some of these streams and prized by the button industry for its lustrous shells. Rose Creek, also in Mower County, supports a healthy population of *Elliptio dilatata* (spike), a Special Concern species that has been nearly extirpated from most of the state. This species is still abundant only in the St. Croix River basin.

The mussel fauna in Pools 1, 2, and 3 of the Mississippi River, once decimated by pollution, is recovering in response to improving water quality during the past 25 years. Twenty-seven mussel species, most of which were represented by young individuals, were found in this reach of the Mississippi River. Included in the assemblage were several Minnesota state listed species, a few of which have not recently been reported either in this reach or anywhere in the state.

LCMR Budget:	$ 363,104.00	Match: $ 0
Balance (July 1, 2001)	$ 0.00	
Completion Date: June 30, 2001		

Result 3: Conservation Planning: Species lists for each completed stream have been distributed to DNR, Division of Fisheries personnel. Consultation regarding mussels has taken place with MPCA and Division of Fisheries personnel. Staff participated in an US Forest Service mussel population viability analysis workshop in Duluth, and a stream classification effort led by The Nature Conservancy. Project staff led a May field trip as part of the National Park Service, St. Croix National Scenic Riverway annual field training for park naturalists. A poster entitled *Mussels of Minnesota* has been completed and distributed to state and national parks, schools and other educators, and to DNR regional offices. An article describing the statewide survey and introductory information about mussels in Minnesota was published in the Conservation Volunteer's Young Naturalist section (July-August 2000). Information about the project was posted on the Ecological Services portion of the DNR's web site. Fact sheets for approximately half of the state-listed mussels were drafted for eventual posting the web site.

Data and technical assistance have already been made available to support a number of educational, scientific, and conservation efforts. Material for educational mussel displays was supplied to the Minnesota Science Museum and the Great Lakes Aquarium. Technical input was provided to The Nature Conservancy regarding the development of a stream classification system in Minnesota and habitat protection priorities in the St. Louis River Estuary. The results of the survey were presented at the 62nd Midwest Fish and Wildlife Conference, Minneapolis, and at the 2nd Symposium of Freshwater Mollusk Conservation Society, Pittsburgh. Information collected from Mississippi River Pools 1-3 has been used to target efforts to reestablish the federally endangered mussel *Lampsilis higginsi (*Higgins' eye pearly mussel) in habitat that is not infested with zebra mussels. Prior to this project very little was known regarding the extent of native mussel recolonization upstream of Lake Pepin or the distribution and abundance of zebra mussels in this area. The results of this project provided documentation that native mussels were recolonizing this reach of the river, reproducing there, and that zebra mussel numbers are as yet too low to have an impact on the native mussels. These results indicate that this reach of the Mississippi River is extremely significant for the conservation of both federal and state listed species.

LCMR Budget: $ 19,512.00 Match: $ 0
Balance (July 1, 2000): $ 0.00
Completion Date: June 30, 2001.

V. DISSEMINATION: Data collected by the project have been entered into the Natural Heritage Information System for use in mussel management, environmental review and species status (listing) determination. Data from this system are widely used by landowners, public agencies and consultants to evaluate project designs and environmental impacts. Data are provided to users upon request in printed or electronic formats and are compatible with Geographic Information Systems. A data request form for Natural Heritage Information System data is available on the DNR's Web Page at http://www.dnr.state.mn.us/ecological_services/nhnrp/nhis.html . Vouchers of mussel shells have been placed in the University of Minnesota's Bell Museum of Natural History and are now a part of their statewide mussel database. More than 3,000 "Mussels of Minnesota" posters have been distributed to educational institutions and the public. Additional posters are available and may be obtained free of charge at the DNR Information Center, 500 Lafayette Rd., St. Paul, MN.

VI. CONTEXT:

A. Significance: According to groups such as the American Fisheries Society and The Nature Conservancy, mussels are the most imperilled group of animals in North America. Twenty-six of Minnesota's forty seven mussel species are now listed as Extirpated, Endangered, Threatened or of Special Concern. While mussels act as "canaries in the coal mine," and are valuable indicators of the health of our waterways, the status of mussels in more than half of Minnesota's river systems is unknown. While this lack of information hinders planning for sustainable development through informed environmental assessment and permitting, the survey work completed during this project has helped considerably. Additional mussel surveys will expedite these processes and allow resource management agencies to avoid or significantly reduce impacts to mussel resources. Data from these surveys will also help avoid project delays caused by the discovery of protected species late in the project planning process. Assessing our natural

assets is the first step toward sustaining them for the future. Due to information collected during this survey effort, Mississippi River Pools 1-3 have been identified as perhaps the last refuge for the Mississippi's native mussels. This reach of the river is the only area above St. Louis where zebra mussels are not causing progressive declines in native mussel populations. During the time of this survey, a federally Endangered species *Lampsilis higginsi* (Higgins' Eye) was repatriated to this reach of the river after a 100 years absence. Recovering mussel populations documented during this survey indicated that water quality had improved enough over the past two decades for previously extirpated species to successfully return.

B. **Time:** The completion of mussel surveys for all of Minnesota's threatened and/or under surveyed rivers will be necessary before sustainable mussel management is possible and is estimated to require an additional two biennia to complete.

C. **Budget Context:** This proposal utilized previous surveys to prioritize efforts and assure that mussel surveys of Minnesota's streams are completed.

1. LCMR Budget History: $ 29,682 (For 1994-1998)
   Surveys of the Big Fork and Little Fork rivers were included in a project funded by LCMR in 1987 entitled *Minnesota Rare Mussel Conservation (K-2).*
2. Non-LCMR Budget History: >$ 30,000
   $30,000 - Nongame Wildlife Fund
   $?? - Private Sector Funding
   Funding for field surveys of limited stream reaches has periodically been conducted by development project proposers on a project-by-project basis. The cost of these projects is unknown.
3. TOTAL: > $ 59,682

VII. COOPERATION: Bell Museum of Natural History - curatorial services for mussels collected as species vouchers. Contact: Dr. Scott Lanyon, University of Minnesota.

VIII. LOCATION: Priority rivers and streams statewide. The water bodies where survey work was conducted are listed in the table below.

Water Body Surveyed	Survey Status
6 lakes in SNF	complete
Ann	complete
Babtism	complete
Babtism (E. Br.)	complete
Bear Creek	complete
Beaver	complete
Beaver Creek	complete
Beaver Creek (E. Fk. Des Moines Trib)	complete
Beaver Creek (Upper Iowa Trib)	complete
Big Cobb	partial
Black Duck Lake	complete

Blue Earth	partial
Bois De Souix	complete
Brule	complete
Canby Creek	complete
Caribou	complete
Cascade	complete
Cedar	complete
Cedar (E. Fk.)	complete
Cedar (Mid. Fk.)	complete
Champepaden Creek	complete
Chanarambie Creek	complete
Clear Creek	complete
Clearwater R	partial
Cloquet	complete
Cloquet Lake	complete
Coon Creek	complete
Coon Rapids Pool	complete
Crooked Creek	complete
Cross	complete
Crow (S. Fk.)	partial
Crow Creek	complete
Dead Coon Lake	complete
Des Moines	complete
Des Moines (E. Fk.)	complete
Elk Creek	complete
Flandreau Creek	complete
Floodwood	complete
Florida Creek	complete
Goose Creek	complete
Grindstone	complete
Grindstone (N. Fk.)	complete
Grindstone (S. Fk.)	complete
Ground House	complete
Hay Creek	complete
Heron Lake Outlet	complete
Kanaranzi Creek	complete
Knife	complete
Knife (L. Sup. Dr.)	complete
Lac Qui Parle	complete
Lac Qui Parle (N. Br.)	complete
Lac Qui Parle (W. Fk.)	complete
Lake Benton	complete
Lake Hendricks	complete
Lake Superior	complete
Lazarus Creek	complete
Le Sueur	complete
Lester	complete
Lime Creek	complete
Little Ann	complete
Little Cedar	complete
Little Cedar Trib	complete
Little Cloquet	complete
Little Iowa	complete
Little Isabella R	partial
Little Minnesota	complete
Little Rock	complete
Little Sue	complete

Long Prairie	complete
Manitou	complete
Manitou Trib	complete
Maple	partial
Medary Creek	complete
Midway	complete
Minnehaha Creek	partial
Minneopa Creek	complete
Minnesota	partial
Minnesota (Diversion Channel)	complete
Mission Creek	complete
Moosehorn	complete
Mud Creek	complete
Orchard Creek	complete
Otter Creek	complete
Otter Creek (L. Sup. Dr.)	partial
Otter Tail	complete
Paleface	complete
Perch Creek	complete
Pigeon R.	complete
Pine	complete
Pine Creek	complete
Pipestone Creek	complete
Pipestone Creek (N. Br.)	complete
Pools 1,2,3	complete
Poplar R.	complete
Red	partial
Red Eye	complete
Red Lake R.	partial
Redwood	partial
Roberts Creek	complete
Rock	complete
Rose Creek	complete
Roseau	complete
Sand Creek	complete
Savannah	complete
Shell	complete
Shell Rock	complete
Snake	complete
Snake (Cross Lk.)	complete
Snake (Pokegama Lk.)	complete
Split Rock	complete
Split Rock Creek	complete
Spring Creek	complete
St. Anthoney Pool	complete
St. Croix	partial
St. Louis	complete
Stoney Brook	complete
Stoney R.	partial
Tamarack (St. Croix Dr.)	complete
Temperance	complete
Turtle Creek	complete
Two Rivers (S. Br.)	partial
Unknown Lake Lac qui Parle Co.	complete
Upper Iowa	complete
Waterloo Creek	complete
Watonwan	complete

Watonwan (N. Fk.)	complete
Whiteface	complete
Willow	complete
Willow Creek	complete
Wing	complete
Winnebago Creek	complete
WLMNGT Lake	complete
Yellow Bank	complete
Yellow Bank (N. Fk.)	complete
Yellow Bank (S. Fk.)	complete
Yellow Medicine	partial