LOCK AND DAM 3 FISH PASSAGE IMPROVEMENT
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
PIERCE COUNTY, WISCONSIN AND GOODHUE COUNTY, MINNESOTA
ENVIRONMENTAL MANAGEMENT PROGRAM
ST. PAUL DISTRICT

FACT SHEET

I. LOCATION

Lock and Dam 3 is at Upper Mississippi River mile 797, about 41 miles downriver from St. Paul, Minnesota and 6 miles upriver from Red Wing, Minnesota (Figure 1).

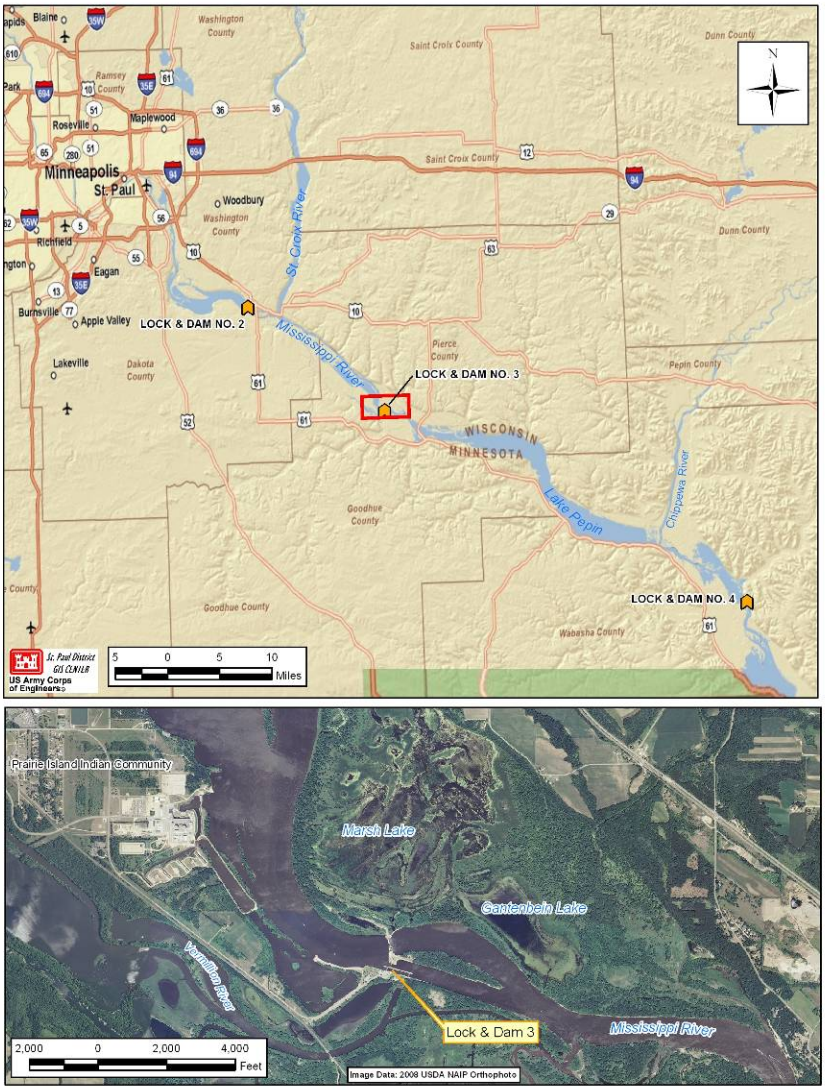

Figure 1. Location of Lock and Dam 3, Mississippi River.

II. EXISTING RESOURCES

Pools 3 and 4 on the Upper Mississippi River support a diverse population of fish and mussel species, including economically important and environmentally threatened species. The walleye and sauger fishery in Pools 3 and 4 is nationally recognized and economically important in the region. A number of threatened and endangered fish and mussel species occur in proximity to Lock and Dam 3. The federally endangered mussel Lampsilis higginsi occurs in the project area, as well as a number of state-listed species (Appendix 1, Tables A-1 and A-2).

Some upriver fish passage at Lock and Dam 3 currently occurs through the open dam gates and over flooded embankments during periods of higher river discharge, and some fish may find their way upriver through the lock chamber. Most migratory fish are attracted to the dam gate openings and aggregate in the tailwater. Upriver fish movements through the dam gates are limited to larger and stronger swimming species, during periods of high discharge when the dam gates are entirely out of the water.

III. PROBLEM IDENTIFICATION

An important attribute of aquatic habitat for river fishes is connectivity; the continuous nature of aquatic habitats in main channels, secondary channels, floodplain water bodies, and tributaries. Habitat connectivity is essential to fulfilling seasonal and life stage-specific habitat needs for river fishes. Fish undergo feeding, climatic (movement between seasonal habitats) and spawning migrations in rivers (McKeown 1984).

Dams like Lock and Dam 3 reduce the connectivity of aquatic habitat by restricting movements of river fishes in addition to other effects of impoundment and river regulation. Impeded fish movements resulting from dams have been implicated in altered fish community structure and declines of many fish populations in rivers throughout the world (Northcote 1998, Pringle et al. 2000).

Each migratory fish species has its own behavioral response to environmental cues for initiating migrations. Many fishes undergo pre-spawning migrations to spawning habitats, spawn in the spring, disperse to feeding habitats, and migrate to winter habitats in the fall. The timing of these movements varies considerably between species, and appears to be generally controlled by water temperature, photoperiod, and river flow. The timing of upriver runs of migratory fishes often does not correspond to times when the dam gates are open, thereby limiting access to upriver habitats.

Restrictions on movements of migratory fish in a river system limit the extent and quality of habitats that they can occupy. Effects of reduced access to habitats can be expressed at the individual, population, and community levels.

Many of the migratory fishes in the UMRS have declined in abundance in the seven decades that most of the navigation dams have been in place. The declines in abundance of skipjack herring and Alabama shad following construction of the Keokuk dam in 1913 (Coker 1929) were clear examples of population-level response to restricted range of migration.

Restricted movements of fish between navigation pools may restrict gene flow within mussel species dependent on a single fish species as their glochidial host (Romano et al. 1991). Large spawning aggregations of migratory fish may once have played a key role in the life history and reproductive success of Unionid mussels in the UMRS.

IV. PROJECT GOALS AND OBJECTIVES

Improved fish passage through Lock and Dam 3 would provide migratory fishes moving upriver from Pool 4 continuity of habitat with an additional 18,551 ha of channel and river lake habitat in the Mississippi and St. Croix Rivers. Access to traditional spawning sites in tributaries with hard substrate, high current velocities, and cool water is needed for spawning by many migratory fish species, including state-listed lake sturgeon and paddlefish. The walleye and sauger in Pools 3 and 4 support a nationally recognized year-round fishery that is economically important in the region. Improved fish passage at Lock and Dam 3 would provide fish continuity of access to tributaries with high quality habitat, including the St. Croix River and its tributaries the Apple and Kinnickinnic Rivers, the Mississippi River, including Lake Pepin, the Trimbelle, Rush, Big, and Chippewa rivers in Wisconsin and the Vermillion and Cannon rivers in Minnesota, for a total of 350 km of tributary river habitat.

Improved fish passage at Lock and Dam 3 would also have a positive effect on native mussel populations. In particular, populations of the Federally endangered Higgin's Eye Pearly Mussel, *Lampsilis higginsi* and Winged Mapleleaf, *Quadrula fragosa*, could benefit from increased abundance and migratory range of their host fish species in the St. Croix River.

The primary objectives of a fish passage project at Lock and Dam 3 are to provide continuous habitat connectivity for migratory fishes through the dam, increase habitat accessibility for migratory fishes, and increase abundance of migratory fish populations.

V. PROPOSED PROJECT

Alternatives for improving fish passage at UMRS navigation dams were examined in Wilcox et al. (2004). Alternatives include assisted fish lockage, dam operation modifications, technical fishways, nature-like fishways, smaller-scale fishways through dam embankments, and large-scale fishways.

Nature-like fishways were found to be most appropriate for most of the UMRS navigation dams including Lock and Dam 3. Nature-like fishways are gradually sloping open channels with rough bottoms or a series of riffles and pools (Wildman et al. 2003). Nature-like fishways have proven to be effective for a wide range of fish species with varying swimming abilities (DVWK 1996, Gaboury et al. 1995, Wildman 2002, Wildman et al. 2003). Nature-like fishways flow continuously, affording year-round fish passage opportunity and habitat for native rock riffle species. A conceptual design for a nature-like fishway at Lock and Dam 3 through the Wisconsin embankment with rock riffles and pools is included as Figure 2.

All reasonable alternatives for improving fish passage through Lock and Dam 3 would be considered in the Definite Project Report and Environmental Assessment.

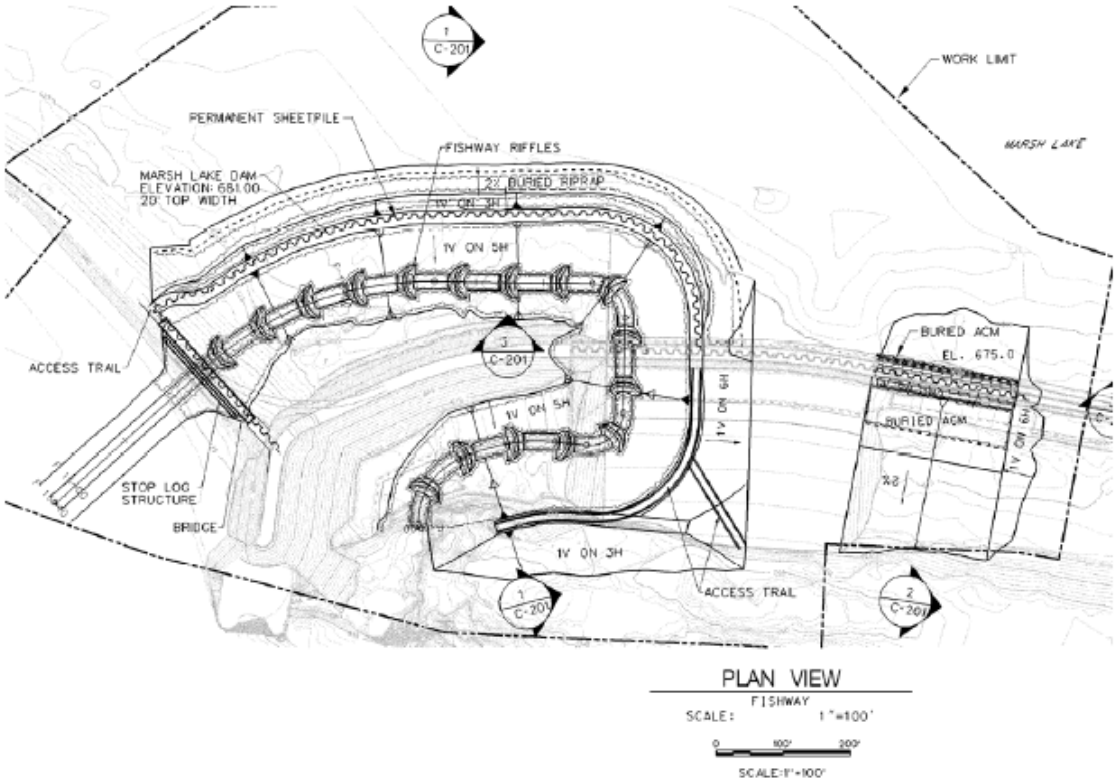

Figure 2. Conceptual fishway at Lock and Dam 3

VI. IMPLEMENTATION CONSIDERATIONS

The Wisconsin embankments at Lock and Dam 3 have deteriorated and are highly vulnerable to failure. Failure of the embankments at Lock and Dam 3 would have severe environmental and economic consequences. The lower embankment at Lock and Dam 3 will need to be strengthened before a fishway can be constructed. The related navigation safety and embankments problems at Lock and Dam 3 were considered in a general reevaluation report and EIS (Corps of Engineers 2007). A fishway was not included as a project feature in that report. The St. Paul District has received ARRA funding to construct the Lock and Dam 3 Navigation Safety and Embankments Project. The lower embankment part of the project will be implemented with a design-build contract.

An impending threat to the northern reaches of the Upper Mississippi River ecosystem is the invasion of Asian carp. Asian carp (bighead and silver carp) have established reproducing populations in Pool 18, north of the high hydropower dam at Lock and Dam 19 at Keokuk Iowa. Individual bighead carp have been found as far north as Lake Pepin, just downstream from Lock and Dam 3. Asian carp are large, strong-swimming fish that can swim upstream through most of the Upper Mississippi River navigation dams either through the dam gates during periods of high river discharge or through the locks during the navigation season. Unfortunately, there are currently no effective barrier technologies that would prevent the eventual invasion of Asian carp into the upper river.

A properly designed fishway at Lock and Dam 3 would probably not have any effect in speeding the invasion of Asian carp northward into Pool 3 but would contribute to larger and more resilient native fish populations. A fishway at Lock and Dam 3 will be designed with a water control structure at the

upstream end to allow the fishway to be closed when large aggregations of Asian carp are in the tailwater.

VII. FINANCIAL DATA

At the request of Wisconsin Senator Feingold and Congressman Kind, the St. Paul District prepared an initial design and cost estimate for a fishway at Lock and Dam 3 in September 2007. The initial design was for a nature-like fishway through the Wisconsin embankment with rock riffles and pools (Figure 2). The estimated cost for planning, engineering, design and construction was $14,900,000 (August 2007 price level).

VIII. STATUS OF PROJECT

The interagency Upper Impounded Reach Planning Team has identified ecosystem objectives for Geomorphic Reach 1 of the UMRS. An objective for this reach is restored habitat connectivity. The associated performance criterion is to provide year-round fish passage for native migratory fishes through Locks and Dams 2 and 3 by 2025.

The St. Paul District and interested stakeholders met on January 14, 2010 to discuss alternative ways toward planning, engineering, design and construction of a fishway at Lock and Dam 3. At the meeting, available authorities and funding sources were reviewed. It was concluded that an initial requirement is to prepare a decision document: a feasibility report and associated NEPA compliance documentation. Upon approval, that report could then serve as a basis for Congressional appropriation that would provide funding for detailed design and construction.

One source of funding available for a Lock and Dam 3 fishway feasibility study is ARRA funding that was provided to the St. Paul District for EMP HREP project planning. Guidance for the ARRA funding requires contract obligation to be made by the end of March 2010. The St. Paul District proposes to use $348,000 of ARRA EMP study funds to contract for a feasibility study for a fishway at Lock and Dam 3.

The River Resources Forum (RRF) in the St. Paul District has been used in the EMP to endorse projects prior to submitting Fact Sheets for approval. The Forum is a formal group of resource managers from the various Federal and State agencies that have management responsibilities on the Upper Mississippi River. The RRF has endorsed this study of improved fish passage at Lock and Dam 3; all RRF voting members voted to support this proposal.

This project will be planned as a future EMP HREP project. It could be implemented as an EMP HREP project, as a Navigation and Ecosystem Sustainability Program (NESP) ecosystem restoration project, or under other authorities depending on Congressional authorization and appropriation.

IX. POINTS OF CONTACT

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X. REFERENCES

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APPENDIX 1: THREATENED AND ENDANGERED FISH AND MUSSEL SPECIES

Table A-1. Minnesota threatened, endangered, and special concern fish and mussel species that may occur in the project area.

END = endangered, THR = threatened, SC = special concern

Fish		
Cycleptus elongatus	blue sucker	SC
Alosa chrysochloris	skipjack herring	SC
Notropis amnis	pallid shiner	SC
Scaphirhynchus platorynchus	shovelnose sturgeon	SC
Opsopoeodus emiliae	pugnose minnow	SC
Ictiobus niger	black buffalo	SC
Polyodon spathula	paddlefish	THR
Acipenser fulvescens	lake sturgeon	SC
Ammocrypta asprella	crystal darter	SC
Mussels		
Lampsilis teres	yellow sandshell	END
Alasmidonta marginata	elktoe	THR
Pleurobema coccineum	round pigtoe	THR
Lampsilis higginsi	Higgins' eye	END
Arcidens confragosus	rock pocketbook	END
Elliptio dilatata	spike	SC
Actinonaias ligamentina	mucket	THR
Megalonaias nervosa	washboard	THR
Quadrula metanevra	monkeyface	THR
Ellipsaria lineolata	butterfly	THR
Ligumia recta	black sandshell	SC
Obovaria olivaria	hickorynut	SC
Quadrula nodulata	wartyback	END
Tritogonia verrucosa	pistolgrip	THR
Cyclonaias tuberculata	purple wartyback	THR
Plethobasus cyphyus	sheepnose	END
Elliptio crassidens	elephant-ear	END
Fusconaia ebena	ebonyshell	END

Table A-2. Wisconsin threatened and endangered fish and mussel species that may occur in the project area.

END = endangered, THR = threatened

Fish		
Hiodon alosoides	goldeye	END
Luxilus chrysocephalus	striped shiner	END
Moxostoma duquesnei	black redhorse	END
Notropis amnis	pallid shiner	END
Cycleptus elongatus	blue sucker	THR
Lepomis megalotis	longear sunfish	THR
Macrhybopsis aestivalis	shoal chub	THR
Moxostoma carinatum	river redhorse	THR
Moxostoma valenciennesi	greater redhorse	THR
Notropis anogenus	pugnose shiner	THR
Polyodon spathula	paddlefish	THR
Mussels		
Cumberlandia monodonta	spectacle case	END
Ellipsaria lineolata	butterfly	END
Lampsilis higginsii	Higgins' eye	END
Arcidens confragosus	rock pocketbook	THR
Quadrula metanevra	monkeyface	THR
Quadrula nodulata	wartyback	THR
Simpsonaias ambigua	salamander mussel	THR
Tritogonia verrucosa	buckhorn	THR