

General information

Name of navigation
or waterborne
transport
infrastructure project

Development of the 3 Meter Navigation Channel of the Middle Mississippi River, Miles 195 to 0.

Country United States

**Project location
(nearest town or city)** St. Louis, Missouri to Cairo, Illinois

**Key project
objectives** The project objectives are to ensure reliable navigation depths and widths on a critical 195 mile stretch of the Mississippi River. This stretch is referred to as the Middle Mississippi River reach, between the confluences of the Missouri and Ohio Rivers. The reach is part of the upper limits of the "open river" reach, whereas the viability of navigation is not dependent upon locks and dams. A reliable channel is developed using river training structures and dredging.

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Position Chief, River Engineering Section

Organisation U.S. Army Corps of Engineers, St. Louis District

Project data

Characteristics of environment

Inland waterway

Rural

Temperate

Protected areas

Key project dates

Project is not in the
planning phase. Date
project planning
started

Project has
consents/approvals.
Date approval was
obtained

Project construction
started. Date
construction started

1890

Project not yet
completed

Type of project

New construction or development

Inland

Brief description

The development of the 3 meter navigation project of the Middle Mississippi River has been ongoing since 1890. Initially, large wooden pile dikes, willow matt revetments, clearing and snagging operations, and dredging, were all used to maintain a 1 meter channel. Eventually a 3 meter channel depth was authorized. Up until about the 1960s wood was used for construction materials, then replaced by stone. River engineering consisted of large perpendicular stone dikes for channel accretion and stone revetment for bank stabilization. In the 1980s, two endangered species, the first being a small bird called the LeastTern, and the second a fish called the Pallid Sturgeon, required river engineers to re-think their design. Rather than build traditional large perpendicular dikes, they had to come up with innovative ways to not only solve dredging problems, but create enhanced habitat for fish and wildlife. Since the mid 1980s to the present, using both large and small scale physical sediment modeling, engineers were able to design and construct a variety of rock training structures that replaced traditional structures, including bendway weirs, blunt-nosed chevrons, w-dikes, side channel enhancement dikes, rootless dikes, hard points, multiple round point structures, and notched dikes. These structures were all designed to create environmental diversity and enhanced habitat while still being able to improve the navigation channel. In many locations, the structures have eliminated or substantially reduced repetitive maintenance dredging. Dredge cuts and dredge disposal can have an instantaneous negative effect on both aquatic and semi aquatic habitat. New structures continue to be developed in this challenging stretch of the river, with both accidents and dredging having been significantly on the decline.

Indicative size

More than 10 million US\$

Working with Nature philosophy

Were steps taken to understand the environment before any work was started on the development of the design of the project?

Yes

Prior to installation of these structures, physical and environmental monitoring is conducted. Physical monitoring consists of collecting high resolution multi-beam bathymetric surveys and Acoustic Doppler Current Profiles. Environmental monitoring includes fish collection, fish tagging, macro invertebrate sampling, and substrate sampling.

Were stakeholders or potential partners involved from the very beginning in the initial process of identifying potential options or solutions and agreeing on a preferred option (i.e. instead of being consulted on already defined options)?

Yes

A multi stakeholder team is involved in the entire river engineering program, from start to finish, including participating in the physical modeling tests, supplying alternatives, and participating in the monitoring. The team includes the navigation industry, land owners, and resource managers and scientists from the U.S. Fish and Wildlife Service, the Missouri Department of Conservation, the Illinois Department of Natural Resources.

Was a solution identified which provided a clear 'win-win'?

Yes

As highlighted previously, the structures create habitat while still improving the navigation channel. Islands have been created, side channels have been preserved or enhanced. Fish abundance and diversity is evident in areas where structures have been placed. One particular habitat, sand bars on the inside of bends for the federally endangered Least Tern, have been preserved by the use of Bendway Weirs, eliminating traditional dikes that would normally be placed across these bars.

Was the project designed to work with and make use of natural processes (e.g. 'letting nature do the work')?

Yes

Did the project include benefits for nature or other environmental enhancements beyond what was legally required?

Yes

By federal law the engineering works are authorized for the single purpose of navigation channel improvement, but engineers in collaboration with the stakeholders, have made improvements to the environment while still achieving navigation channel project dimensions: ie, 3 meters deep, 900 meters wide, at low water.

Did the project follow, in order, the steps described in the Working with Nature Position Paper?

Yes

Project objectives are continually established upon the particular sub-reach or the Middle Mississippi River. The partners meet together at physical modeling meetings, site visits, coordination meetings, and annually on an inspection trip of the entire river reach. The team includes fisheries and wildlife managers and biologists that understand the environment because they are intimately involved with the collection of data and the analyzing of trends. It also includes pilot that are familiar with naviga

Reasons/motivation for taking this approach

The costs of the structures usually pay for themselves within the first 3 to 5 years after construction, because the costly dredging is either eliminated or substantially reduced. We developed a collaborative plan formulation process back in 1980 but refine it every year to adjust with both the needs of navigation and the environment. Our motivation was based upon respecting the Federal Endangered Species Act, and listening to the concerns of our partners for habitat sustainability. Our charter emulates the "working with nature philosophy", because we design and build river training structures by involving stakeholders early on in the process. Our goal is to have our partners help take ownership of collaborative plans. As a result, some of the new and innovative structures implemented in the river were the result of ideas brought forth by biologist and then refined by engineers. Our success is driven by eliminating dredging, making the navigation channel safer, and creating environmental diversity. The accidents that use to occur in this reach of the river have been dramatically reduced. Prior to installation of our bendway weirs, there were two major oil spills that occurred along two of our bends. After installation, currents allow pilots to safely navigate through the reach. This is imperative considering that more and more volatile commodities are being transported on the river, including petro and chemical products. Barge industry tow sizes have grown because the channel is now more reliable. This has been attributed to the improved conditions in the bends, and the reliable depths in the crossings achieved by the chevrons, w dikes, notched dikes, and rootless dikes. In addition, we have taken measures to preserve and enhance our side channels, a challenge considering that diverted flow means less for navigation.

Cost implications

Costs were lower than the conventional approach to this type of project (i.e. cost savings were made)

No additional funds were provided from third parties

No extra costs compared to conventional approach

Costs were not marginally or significantly higher than a conventional approach to this type of project

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Percentage of the total cost that was an additional cost associated with adopting these elements of Working with Nature

No increase in cost is required.

Did existing legislation help or hinder your application of the Working with Nature philosophy?

The approach adopted helped to meet legal obligations

The existing project authorization is somewhat limited on our ability to take additional steps for the environment. Usually, we can modify or design different structures for the environment as long as navigation needs are met, but going outside the footprint and building additional structures for mitigation or additional enhancement measures is outside our present authorization.

What was done did not exceed legal requirements

No problems were experienced with existing legislation

The approach was not taken despite legal requirements

Legal requirements did not prevent the Working with Nature philosophy being applied

Further information

Further information can be obtained from the US Army Corps of Engineers, St. Louis District, Applied River Engineering Center <http://mvs-wc.mvs.usace.army.mil/arec/> Or by Contacting the St. Louis District River Engineering Office, 314-865-6326