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# Lower Yellowstone River Fish Passage



from **Engineering With Nature: An Atlas, Volume 2.**

by US Army Engineer Research and Development Center



## Dawson County, Montana, United States

**Promoting and protecting pallid sturgeon migration by expanding river access.** The Lower Yellowstone Irrigation District provides irrigation water to over 23,000 hectares of land. However, the diversion dam on the Lower Yellowstone River impeded upstream migration of pallid sturgeon (*Scaphirhynchus albus*), an endangered species, and other native fish for over 100 years. As part of a Bureau of Reclamation project, the U.S. Army Corps of Engineers (USACE)–Omaha District built a new headworks, weir, and fish bypass channel as a way to provide access to as many as 266 additional kilometers of the Yellowstone River for pallid sturgeon migration, spawning, and larval development. The headworks has 12 cylindrical screens to prevent fish entrainment in the irrigation channel, and the screens can be raised when not in use and during maintenance. The screens are self-cleaning, since the design includes brushes that clean the screens as they rotate. The bypass channel runs for 3,398 meters from the upper end of the existing channel to just downstream of the weir on the south side of the river. A replacement concrete weir will sit just upstream of the existing one and provide sufficient water surface elevation to maintain

irrigation diversions through the headworks. Through its efforts, the project contributes to the recovery of pallid sturgeon.

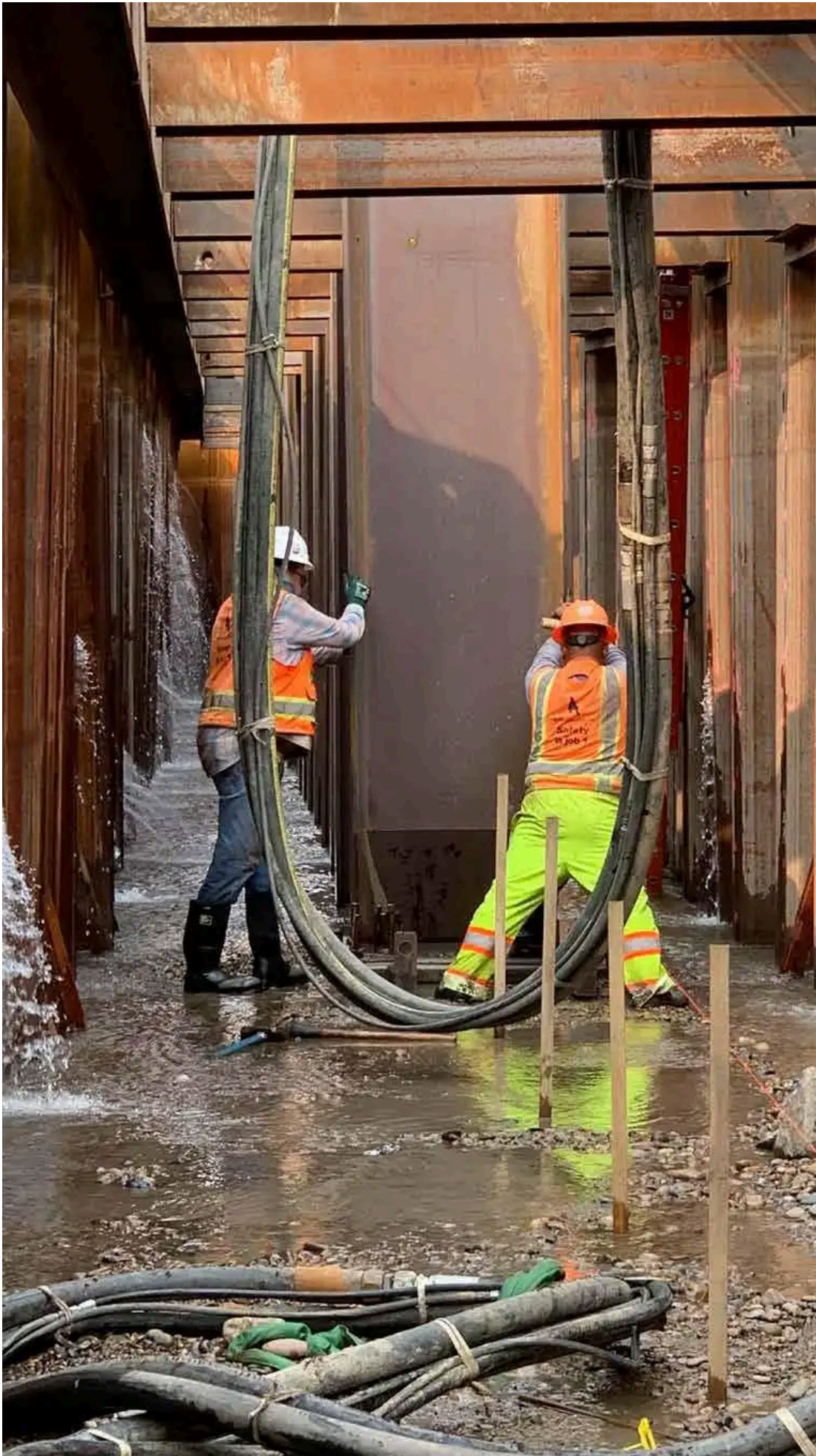
Article cover: Looking upstream during construction of the south half of the new irrigation weir, September 2020. The bypass channel is nearly completed and will be opened after construction of the weir is complete. The historic rocking tower will be relocated on the property. The old and new headworks structures are visible on the right. (Photo by Ames Construction Inc.)

## **Producing Efficiencies**

The irrigation project used all-new technology, incorporating cylindrical screens that reduce the negative impacts on pallid sturgeon and other native fish. The project team used hydraulic models to determine crop consumptive use requirements and to evaluate which option best met the design criteria for the fish passage. These models also ensured enough water flowed through the bypass channel to allow fish to pass while still maintaining adequate flow conditions for irrigation requirements. The bypass channel and downstream face of the weir reused cobbles excavated as part of construction, taking advantage of the locally available materials.

## **Using Natural Processes**

Radio tracking of telemetered wild adult pallid sturgeon indicate that during their upstream migrations, they can and will use side channels. The project team designed the Lower Yellowstone bypass channel with slopes, substrates, depths, and velocities similar to natural side channels used by pallid sturgeon, maximizing the likelihood that pallid sturgeon will use it. The entrance of the bypass channel is also immediately downstream of the rock field below the weir to maximize the potential for upstream migrating pallid sturgeon to find the bypass channel.







Interior of the temporary cofferdam prior to placement of the south half of the new concrete weir. Workers are ensuring correct alignment of piling used to anchor the weir into the bed of the river, September 2020.

(Photo by Al Steiner, U.S. Bureau of Reclamation)

## Broadening Benefits

Game fish in the lower Yellowstone River include paddlefish (*Polyodon spathula*) and the threatened shovelnose sturgeon (*Scaphirhynchus platorhynchus*). The most popular game fish is the paddlefish, with nearly half of the annual visits to the site occurring during the paddlefish season in May and June. Paddlefish congregate on the downstream side of the dam, presenting an accessible location for paddlefish snagging. Increasing the number of traversable feet of the Yellowstone River for native fish will increase the local populations of game fish and improve the surrounding habitat, creating an additional opportunity for local revenue.



Cylindrical screens reduce the intake velocity and prevent fish entrainment into the canal when water is diverted for irrigation. The screens rotate, and debris is removed using brushes on the inside of the cylinder.

(Photo by Al Steiner, U.S. Bureau of Reclamation)

## Promoting Collaboration



USACE worked with the Bureau of Reclamation to complete the environmental impact statement. The two agencies then teamed up with the Montana Department of Fish, Wildlife, and Parks; the Montana Department of Natural Resources and Conservation; the Lower Yellowstone Irrigation Project Board of Control, the Fish and Wildlife Service, and the Western Area Power Administration, who provided expertise and local knowledge to ensure the project was a success. Further, a team of pallid sturgeon experts established design criteria to assist with the project and provided input throughout construction.



New headworks from the land side in 2014.  
(Photo by USACE Omaha District)



Installation of wooden beams near the south abutment, circa 1908.  
(Photo provided by USACE Omaha District)



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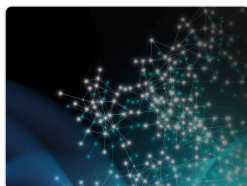
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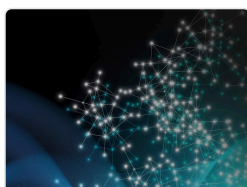
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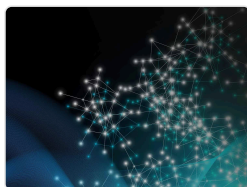
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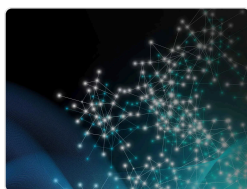
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