

Rock Arch Rapids Info from MN DNR

Regarding: Proposal HRE 10, [Silver Lake Dam Fish Passage Modification](#) – City of Rochester

Email reply to LSOHC Staff from Jamison Wendel, Fisheries Habitat Manager, MN DNR Fish & Wildlife Division:

Thanks for contacting me about this topic. Here is a link to the document “Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage”.

https://www.dnr.state.mn.us/eco/streamhab/reconnecting_rivers.html This book provides excellent background information on this topic and is used as a reference still for many stream practitioners. The science has evolved since this book was written but the concepts outlined still serve as a foundation for this work. The book also summarizes about 30 different projects where a dam was converted to a rock arch rapids (RAR) style project. Some of these projects have been functioning since the 1990’s and have required little to no maintenance.

Responses to your questions are below and I’d be happy to discuss this topic with you further.

Question 1: Has there ever been a major failure of a weir system used to replace a low-head dam?

I am not aware of a project where a dam was converted to a rock arch rapids (RAR) and later experienced a major failure. A well designed RAR project mimics naturally functioning stream riffles and typically requires little to no maintenance. Some projects have been impacted by large ice flows or major flood events soon after construction was completed. However, those impacts were relatively minor and quickly repaired.

The conceptual design currently proposed by the city of Rochester is unique in that it combines both a whitewater wave feature and only a portion of the channel is intended to allow fish passage. The whitewater wave feature proposed by the city is much different than a RAR style project and the concept is untested in Minnesota. DNR staff have also expressed concerns to the city about the ability of the proposed project to adequately provide fish passage due to the proposed narrowness of the rock arch rapids.

Question 2: How many dams have thus far been replaced in MN with weir systems?

Since 1994, we are aware of 64 dams in Minnesota that have been modified to rock arch rapids to provide for fish passage. This estimated total number of projects is conservative and there are likely a few projects that either we erroneously left out or were not aware of.

Question 3: can you list those locations for me?

The Reconnecting Rivers book linked above contains many examples of projects using RAR. Additionally, here are some examples of recently completed projects modifying dams for fish passage (many using Outdoor Heritage Funds!):

Hallock Dam

Pelican Rapids Dam

Four lake outlet dams on the Otter Tail River

Four dams on the Sand Hill River

Pine River Dam, here is a good article about that project:

<https://www.mprnews.org/story/2022/07/05/rock-rapids-replace-aging-dams-to-let-minn-rivers-flow>

Question 4: To what extent has weir technology been used in other states and for how long?

Here are two paragraphs from page 47 of Luther Aadland's Reconnecting Rivers document:

Rock ramps have been built in Europe since the early 1970s and were originally applied as a means of stabilizing riverbeds. Some of these ramps had slopes too steep (10% or greater) to provide fish passage, while those specifically designed for fish passage were generally 7% or less (DVWK, 2002).

Prior to projects detailed here, few rock ramps had been built in North America. The Eureka Dam on the Fox River in Wisconsin was converted to a "rock ramp" in 1988. Lake sturgeon have been observed spawning in this fishway (Ron Bruch, personal communications). A pool and riffle fishway was built on the Roseau River in Manitoba in 1992 (Gaboury et al. 1994). Work by Newbury and Gaboury (1993) and Rosgen (1994) provided insights into natural channel design techniques.

The first RAR style projects were completed 50 years ago. In Minnesota, we have many examples of projects completed in the 1990's that are still providing their original function today and have required little to no maintenance. Multiple low-head dams on the Red River have been successfully converted to RAR. The Red River is prone to major flood events and these projects have proven to maintain their structural integrity.

Thanks,

Jamison

Jamison Wendel *he/him/his*

Fisheries Habitat Manager | Fish and Wildlife Division