

Evaluation of River-spanning Performances: Rock Ramps

Design guidelines for rock ramps will improve performance and reduce repairs and replacement costs

Future Development Plans

The rock ramp research is part of a larger effort to evaluate the use of natural materials in many types of water engineering projects. Results from the rock ramp research will be incorporated into a river-spanning rock structure design guidance document.

More Information

Additional information on river spanning rock structures research and associated physical modeling and field performance reports are available at:

www.usbr.gov/pmts/sediment/kb/SpanStructs/index.html

Contact Information

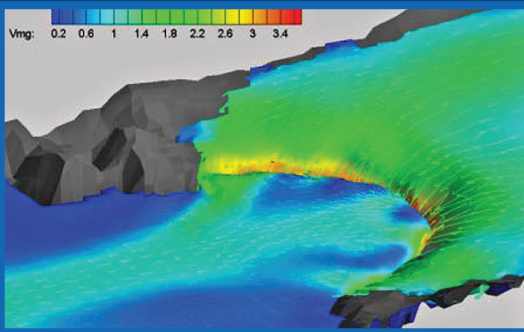
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Collaborators

Reclamation:

- Science and Technology Policy and Administration Programs
- Pacific Northwest Region
- Great Plains Region
- Albuquerque Area Office

Modeling the velocity of bankful flow at a U-weir.



Problem

River-spanning rock ramps help meet water deliveries in an ecologically sound manner. They function as low-head diversion dams, permitting fish passage, create habitat diversity, stabilize streambanks and profiles, and more. As widespread use of rock ramps increases, the need for reliable design methods with a broad range of applicability at individual sites grows as well. However, guidance for sustainable construction and retrofit techniques is lacking for instream rock ramps.

During low streamflows, rock ramps must convey enough surface flow to meet passage requirements. Designing ramps to ensure sufficient surface flow is not well understood. The current state of the art does not provide the designer with adequate guidelines to establish a low flow limit of operation for rock ramps.

Solution

Reclamation formulated a study combining field investigations and laboratory physical modeling to investigate the:

- Ratio of interstitial flow to surface flow passing down rock ramps as a function of ramp material gradation
- Effectiveness of “choking” treating the finished rock ramp surface with choke material designed to reduce surface permeability.

Design guidelines generated from this study will provide information for the development of sustainable construction and retrofit techniques—minimizing the structure lifecycle costs and maximizing their ability to reliably meet management objectives.

Results of field investigations and physical modeling showed that choking of the rock ramp reduced the percentage of subsurface flow by as much as a factor of four.

Benefit

Natural resource managers with a need for aesthetic river structures composed of natural materials for diversion, fish passage, channel stabilization, etc., will benefit from the results of this research. The design guidelines will be used by project engineers to design rock ramps to meet their intended objectives.



Application

Research on the selection of a ramp gradation and choking material gradation and placement has been applied to rock ramps on the Colorado River near Palisade, Colorado. Results from this research are currently being used in the design and physical testing of a large rock ramp on the Yellowstone River, near Intake, Montana.