

Vortex Rock Weirs: Assessing Fish Passage at Design and after Construction through Modelling and Measurement

**Paul Villard¹,
Bryce Molder¹,
Julian Krick¹**

¹GEO Morphix Ltd., Milton, Canada

Vortex rock weirs are design elements that mimic naturally-forming cascades and are used for erosion control and habitat restoration in moderate to high gradient channels. They are extensively used in urban erosion control projects. During high flows they provide flow training, bed control, and energy dissipation. Properly designed and installed they can also mitigate fish passage issues, and provide low flow and high velocity refugia. These features come in a diverse range of shapes, configurations, and sizes. However, subtle differences in morphology and stone placement can result in impaired fish passage or loss in anticipated habitat benefits. Hydraulic models can be applied to improve outcomes at the design stage, while monitoring after construction can be used to evaluate and potentially identify deficiencies. The hydraulics associated with these features is examined over a range of flow conditions through both modelling and detailed hydrodynamic field measurements. Both simple and complex hydraulic models, which could provide value at the design stage are reviewed in the context of these detailed field measurements. Several vortex rock weir installations with different morphologies and rock placement strategies are reviewed to illustrate the hydraulic outcomes and potential for fish passage.

Biography

For over two decades Dr. Villard has been involved in research related to geomorphology. His research has covered a range of topics including fundamentals of sediment transport, channel evolution, field measurement techniques, urban impacts on rivers, and the benefit of restoring river systems. He has been involved in projects throughout Ontario, Manitoba, California, the northeastern United States and Belize. He is the Principal Geomorphologist at GEO Morphix Ltd. and a member in good standing of the Association of Professional Geoscientists of Ontario, and the Associations of Professional Engineers and Geoscientists of Alberta and Manitoba.