Lessons learned from using a 3D numerical model and suitability analysis to assess a lake sturgeon restoration project in the Ouareau River (Quebec)

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Abstract

Two-dimensional (2D) or three-dimensional (3D) hydrodynamic models are increasingly employed to assess fish habitat, ideally prior to interventions. This study uses a 3D model (Delft 3D) to retroactively assess a restoration project in a large (80-m wide) river (Ouareau River, Quebec), which did not meet its objective of providing additional spawning habitat for lake sturgeon (*Acipenser fulvescens)*. Virtual modifications of the bathymetry allowed for the flow field to be simulated with and without boulder weirs constructed in 2007 for four discharges representing flow conditions during spawning. Simulated velocities and flow depths were used in a fuzzy analysis which employed an existing habitat suitability index (HSI) for lake sturgeon spawning to determine the suitability of the site and to assess the impact of in-stream structures. Results reveal that the boulder weirs did not meet the expectation of either raising water levels, or increasing current velocity. These results point to the need for 1) adaptive management protocols, with an iterative decision-making process to allow for adjustments in hypotheses and strategies to improve the management process, 2) multi-disciplinary input, including fluvial geomorphology, and 3) a more systematic use of 2D or 3D numerical models prior to the implementation of in-stream structures in river restoration projects.

About the presenter

After achieving his undergraduate degree in geography, Mr. Baril earned his M.Sc. from Concordia University. His interdisciplinary graduate degree was within the Biology department, but concentrated on both fluvial geomorphology and fisheries ecology under the supervision of Dr. Pascale Biron, and Dr. James W.A. Grant. Since starting his career in consulting, Mr. Baril has been working with GEO Morphix as a field technician in projects related to water quality, hydrodynamic modeling, natural channel design, ESC monitoring, and geomorphological assessments.