Bioenergetic models as a means to evaluate habitat availability

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Determining optimal biophysical conditions is a major challenge to fish habitat preservation and restoration. Bioenergetic models provide a framework for linking stream hydraulics and food availability to fish energy expenditure. Practical applications of such models serve as a means to evaluate quality and availability of aquatic habitat to inform restoration design. However, these models presently lack adequate validation in natural channels, which would require fish size, abundance and location data. Passive intergrated transponder systems track locations of tagged fish, but require relatively extensive and intrusive labour to install. Alternatively, collecting the necessary observations for small fish (e.g., juvenile Atlantic salmon) in shallow streams can be obtained with underwater video. In this study, field observations were made with waterproof Sony HDR-AS100V action cameras, positioned in stream channels in order to determine species and population, during various flow conditions across three sites within the Credit River Valley. From the resulting footage, 6 fish species were identified, individual locations were mapped, and length estimates were made in order to test bioenergetic model outputs. Length estimates were made using an inverse square relationship and fish position relative to proximity to the camera and a scale within the frame. Turbidity limited the success of this method, as only 18% of camera placements in >6NTU conditions resulted in at least one fish being captured in frame. Using fish size as an input, a bioenergetic model was run to estimate optimal usable area within the stream channel. The preliminary model results show juvenile salmonid habitat quality varies through the summer season, but is significantly enhanced by spatially variable flow conditions within small channel reaches. The ability to move in and out of higher velocity flow conditions was important to foraging and refuge. Studies such as this provide important input data and serve as benchmarks for habitat preservation.

Biography

John Tweedie completed his BSc at University of Guelph in 2016, and will complete his MSc investigating the hydromorphic dynamics of juvenile Atlantic salmon habitat availability in reaches of the Credit River. Growing up in Southern Ontario, John is eager to contribute to our understanding of stream systems in this unique environment.