

Studying the geomorphic aspects of changes to fish habitat below hydro dams: changes to bed substrate characteristics as well as changes to size and morphology of channels



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Rationale: Rivers have been important to humans since the antique period for crop irrigation, navigation for colonialism, settlement, etc., but also for ecosystems, because rivers support a substantial biodiversity and provide important ecosystem services. Engineers have studied water ways for irrigation and flood prevention for thousands of years, but it was only at the end of the 19th century that natural systems interested the scientific community. Fluvial geomorphology is the art of conciliating the study of physical processes which drive rivers, such as flow and sediment transport to ecological problems.

Description: Dams are known to regulate flow and modify sediment transport rates of rivers. Both modifications often lead to channel bed alteration where alternate end point responses from dam construction are degradation and aggradation on the channel bed. The general objectives of my doctoral research consists of (1) detecting morpho-sedimentologic changes below specific dams in Canada (HydroNet selected sites), (2) developing methods to evaluate the direction and magnitude of the changes and (3) testing predictive models in order to better understand how the physical habitat of fish could be affected by channel metamorphosis and bed surface texture change. Multi and hyper-spectral remote sensing analysis and field work samples will help me to detect the long term morpho-sedimentologic modifications downstream of dams as well as collect data for modelling the future channel shape equilibrium.

Outcomes:

- Classification maps to see the quality and availability of the physical fish habitats downstream of dams.
- Development of new tools to detect morpho-sedimentologic instabilities due to damming.
- Prediction of the future “state” of the river (Hydraulic geometry and substrate composition).

Benefits from this research: My doctoral research will develop a better understanding on how hydro-dams influence the downstream morpho-sedimentologic aspects of a river by modifying both the river flow and the sediment transport regime. Thus, this study can provide insights on dam operation in order to minimize the effects on the downstream habitat.

