Remote sensing of river structure in the context of mapping hydraulic habitat at the reach scale.

\*Fabien Hugue (PhD Student), Michel Lapointe

McGill University, Department of Geography

(fabien.hugue@mail.mcgill.ca; Oral presentation)

Recent techniques of remote sensing and geographical information science have improved efficiency of analyzing earth surface features. Various applications of these techniques are much used to assess environmental and ecological processes. With the development of new sensors and the availability of high resolution multi spectral imagery, fluvial geomorphology is experiencing a revolution in mapping rivers. Exploiting the power of aerial or satellite imagery is indispensible in multi-river studies such as conducted in HydroNet SNG, given poor accessibility to remote sections of river systems and large spatial extent of rivers studied, constraints which make the collection of high resolution field data impractical. This study presents a satellite remote sensing method that helps describe river habitat structure, in which hydraulic habitat statistics (depth-velocity) at the pixel, reach and segment scales can be generated to help interpret fish community data.

Spectral based, depth maps for HydroNet river sites were extracted from high resolution (2m) multispectral satellite images (4 to 8 bands). In the absence of the high cost topographic surveys of river bed and water surface slopes needed to conduct CFD hydraulic simulations, empirical, pseudo 2D hydraulic rules were used here to generate flow velocity maps over 10 km reaches. Information on riparian cover, emergent boulders, rock outcrops and LOD visible on the image (0.5m pixel for panchromatic Worldview images) combined with depth-velocity maps can be used to assess the river habitat structure at a finer grain and with less subjectivity than classical meso-habitat classifications.

The method described allows a reasonably accurate characterization of the hydraulic habitat over large extents, without the need of intensive field surveys. Applications from this method include understanding how river habitat heterogeneity affects fish distribution and locating habitats more sensitive to alteration due to upstream damming. It can also be used to describe habitat variability across the HydroNet river sites as well as identifying any systematic variations in habitat structure between the regulated sites and the natural rivers.

Key words: High resolution multispectral remote sensing, river structure, Hydraulic habitat, depth-velocity maps.