Ontario Chapter Report: Rivers and Streams

Our annual meeting had several interesting talks about streams and river. Here is a sample.

American Fisheries Society Ontario Chapter Annual General Meeting, March 2–4, 2017 Geneva Park, Orillia, Ontario

N.E. Jones, B.J. Schmidt **Tributary Effects in Rivers: Interactions of Spatial Scale, Network Structure, and Landscape Characteristics.**
Ontario Ministry of Natural Resources and Forestry, Trent University, Peterborough, Ontario.

Landscape characteristics in combination with the physical structure of branched stream networks define the environmental conditions available for lotic biota. From simple stream network "laws" can emerge a spatially explicit understanding of habitat heterogeneity. Based on geographic information system analyses, we explore how stream networks integrate spatial heterogeneity of the landscape and form new characteristics as stream segments accumulate into progressively larger drainages, and how these changes in landscape characteristics relate to confluence symmetry ratio and drainage size. Simple expectations for stream networks include: (i) abrupt changes in longitudinal patterns are more probable among the numerous small and diverse headwater streams than in large, rare, and characteristically similar tributaries, (ii) the many small tributaries flowing into large main stem channels cause individually small, yet collectively gradual changes in longitudinal patterns. Such a spatial understanding of where change is likely to occur helps to reconcile gradual river continuum and abrupt discontinuum views of patterns in rivers and predict the locations of significant confluences, ecological transitions, longitudinal gradients, and patterns of biodiversity in stream networks.

M. Brochu[1*], N.E. Jones[2], B.J. Schmidt[2], P.C. Frost[3], and S.J. Melles[4]
Discontinuities in Stream Networks: The Likelihood of Ecological Change Downstream from Tributaries
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Network perspectives of branching systems have only recently gained the attention of stream ecologists. Within this paradigm shift, there is a keen interest in habitat spatial heterogeneity in terms of ecotones and biodiversity "hotspots" found at tributary confluences. There has been little research, however, to understand what types of tributaries lead to ecological change at larger scales (e.g., stream segments) downstream of tributaries. Differences in confluence symmetry ratio (tributary size relative to the mainstem) and stream type (landscape characteristics) may affect the likelihood of change downstream from tributaries. For example, a relatively small and warm turbid tributary flowing into a cold clear trout stream may cause greater changes downstream than a similar sized tributary that is also cold and clear. We sampled confluences (n=34) in southern Ontario to examine what types of tributaries lead to ecological changes downstream with a focus on benthic macroinvertebrate (BMI) communities. Our results showed that BMI community did not change as predicted indicating that abrupt changes in stream networks are not as common as the theory may suggest. The lack of changes we note might be related to the community-based measures of (dis)similarity used and the relatively small range of stream types within our study area. Pursuing this research using a wider range of stream types could show greater ecological change below confluences.

Jeff Muirhead, M.ASc., B.Eng., E.I.T., Stantec Consulting Ltd. **The Need for Consistency in Post-Construction Monitoring Programs of Stream Restoration Projects**
A stream restoration project requires 3 – 5 years to fully vegetate and stabilize following completion of construction and planting. Prior to the complete establishment of vegetation, the stream is vulnerable to erosion which can alter the as-constructed planform and profile and damage in-stream structures. Left unmitigated, these alterations can escalate into costly reach-scale failures in the constructed watercourse. It is therefore important to monitor stream restoration projects for 3 – 5 years following completion of construction, to ensure the long-term success of the restoration. Unfortunately there is currently a lack of consistency in post-construction monitoring programs of stream restoration projects in Canada. In some cases, monitoring programs are not performed at all. Where they are performed, the specifics of the monitoring program vary greatly depending on regulatory jurisdiction, project objectives, budget considerations, and permit requirements. This presentation presents several stream restoration case studies illustrating the variability in post-construction monitoring approaches. The examples are used to outline the risks and consequences which have, or could, result from protocol deficiencies or lack of program altogether. A model of a meaningful and cost-effective post-construction monitoring protocol is proposed as a starting point for discussion between proponents, consultants, and regulatory agencies.

Jeff Muirhead, M.ASc., B.Eng., E.I.T., Stantec Consulting Ltd. **The "Threshold" of Habitat: Spawning Salmon in a Restored Threshold Channel**
Many stream restoration projects in North America are situated in an urban or semi-developed environment. Under these circumstances, restoration designs are frequently required to maintain the same channel plan and profile over a wide range of flood flows, and must do so recognizing the modified flow regime and decreased bedload from the altered land use in the watershed. Threshold channels are often implemented to satisfy these objectives; riffles are composed of large particles which cannot be moved over the range in channel flows, maintaining channel location and geometry despite no coarse material being supplied by the upstream watershed. However, restoration designs are often also required to provide aquatic habitat to compensate for development activities. The ability of threshold channels to provide aquatic habitat has been a topic of debate between regulators and designers alike, resulting in difficulties meeting biological and hydraulic/geomorphic objectives. Here, we present an instance of salmon migrating and spawning in a threshold channel, as an example of restoration design success from a biological perspective and as a starting point for discussion between biologists, geomorphologists, and river engineers.

NE. Jones, Chu, C. DiRocco, R., and Thorn, M. **Past Present and Future Outlook for Brook Trout in the Lake Simcoe Watershed**
Brook trout are experiencing population declines throughout their native range and in the Lake Simcoe watershed due to a variety of human disturbances. Information is lacking regarding the current distribution of brook trout, barriers, and habitat quality in the Lake Simcoe watershed but

this information is needed to direct conservation and management efforts. We developed models to predict the thermal habitat and distribution of brook trout. The occurrence of brook trout was positively related to overburden thickness, base-flow index, channel slope, stream power index, elevation, and treed area, whereas brook trout were negatively related to the maximum monthly air temperature. The hindcasted distribution was 47% larger than the current distribution and revealed that brook trout have retreated into the headwater regions of the watershed. Presently, most headwater streams in the Lake Simcoe watershed are cold water habitat but the model projects a substantial decrease in the amount of cold water streams over the next 50 years. Since pre European development, coldwater thermal habitat has decrease by 73%, and with an A2 climate change scenario (2065), is likely to decease to just 14%. Coolwater habitat has increased by 284% and will be 687% by 2065.