# Examination of geological gradients as a driver of stream biological communities in south-central New Brunswick, Canada

Michelle A. Gray[1,3], Jennifer Lento[2,3], Allison Ferguson[2,3], and R. Allen Curry[1,2,3]

*1. Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada <mgray1@unb.ca>*

*2. Department of Biology, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada*

*3. Canadian Rivers Institute, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada*

The New Brunswick Energy Institute (NBEI) sought research to support better understanding of the potential impacts of intensive shale-gas development on surface waters in south-central New Brunswick. A two-year research program was designed to characterize baseline chemical, physical, and biological conditions in surface waters predevelopment; and support the ability of provincial and federal regulators to assess and detect changes of concern during or post-development. The overall research program was split into five distinct sub-projects, or components, including; assessment of groundwater inflows and stream temperature, characterization of water quality and biological community structure, characterization of sediment geochemistry, development of a method to assess dissolved methane in streams, and development of an online data portal for publicly accessible data. Water quality analysis revealed a distinct separation among stations that was driven by a strong gradient in ions, nutrients, and metals. There was a clear pattern of higher levels of ions, nutrients, and metals at stations located in areas of glacial veneer surficial geology, and lower levels at stations located on undifferentiated bedrock, indicating a natural geology-driven gradient in water chemistry among the study sites. Assessment of physical habitat and GIS data supported the importance of geology in the study area, with both surficial geology and bedrock geology playing a dominant role in distinguishing among stations. Both benthic macroinvertebrate communities and fish communities were distinguished on the basis of underlying surficial geology at the largest scale, with benthic macroinvertebrates appearing to be more directly driven by differences in water chemistry, and fish appeared to respond most strongly to physical habitat variables and temperature at the site-scale. Underlying geology was expected to explain a large proportion of variation in stream and river water quality, however the strength of the association between the geology and the benthic invertebrate and fish communities was an interesting result and will lead to more directed data analysis and research to explore these relationships.

Atlantic Geology, 2017, Volume 53
Atlantic Geoscience Society Abstracts – 43rd Colloquium & Annual General Meeting 2017
doi: 10.4138/atlgeol.2017.006