

## Impacts of Climate Change and Natural Gas Operations on the Hydrology of Northeastern BC, Canada: Quantifying the Water Budget for Coles Lake

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**Abstract :** Climate research has repeatedly identified strong associations between anthropogenic emissions of 'greenhouses gases' and observed increases of global mean surface air temperature over the past century. Studies have also demonstrated that the degree of warming varies regionally. Canada is not exempt from this situation, and evidence is mounting that climate change is beginning to cause diverse impacts in both environmental and socio-economic spheres of interest. For example, northeastern British Columbia (BC), whose climate is controlled by a combination of maritime, continental and arctic influences, is warming at a greater rate than the remainder of the province. There are indications that these changing conditions are already leading to shifting patterns in the region's hydrological cycle, and thus its available water resources. Coincident with these changes, northeastern BC is undergoing rapid development for oil and gas extraction: This depends largely on subsurface hydraulic fracturing ('fracking'), which uses enormous amounts of freshwater. While this industrial activity has made substantial contributions to regional and provincial economies, it is important to ensure that sufficient and sustainable water supplies are available for all those dependent on the resource, including ecological systems. In this turn demands a comprehensive understanding of how water in all its forms interacts with landscapes, the atmosphere, and of the potential impacts of changing climatic conditions on these processes. The aim of this study is therefore to characterize and quantify all components of the water budget in the small watershed of Coles Lake (141.8 km<sup>2</sup>, 100 km north of Fort Nelson, BC), through a combination of field observations and numerical modelling. Baseline information will aid the assessment of the sustainability of current and future plans for freshwater extraction by the oil and gas industry, and will help to maintain the precarious balance between economic and environmental well-being. This project is a perfect example of interdisciplinary research, in that it not only examines the hydrology of the region but also investigates how natural gas operations and growth can affect water resources. Therefore, a fruitful collaboration between academia, government and industry has been established to fulfill the objectives of this research in a meaningful manner. This project aims to provide numerous benefits to BC communities. Further, the outcome and detailed information of this research can be a huge asset to researchers examining the effect of climate change on water resources worldwide.

**Keywords :** northeastern British Columbia, water resources, climate change, oil and gas extraction

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