University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (Hons) (University of Guelph, 2014)

"Impacts of climate change and intensive lesser snow goose (*Chen caerulescens caerulescens*) activity in high Arctic pond complexes - Banks Island, Northwest Territories"

School of Environmental Studies

Friday, January 11, 2019
10:00 A.M.
Clearihue Building
Room B021

Supervisory Committee:
Dr. Trevor Lantz, School of Environmental Studies, University of Victoria (Supervisor)
Dr. Robert Fraser, School of Environmental Studies, UVic (Member)

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Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Rapid increases in air temperature in Arctic and subarctic regions are driving significant changes to surface water. These changes and their impacts are not well understood in sensitive high Arctic ecosystems. This thesis explores changes in surface water in the high Arctic pond complexes of western Banks Island, Northwest Territories, and examines the impacts of this change on vegetation communities. Landsat imagery (1985-2015) was used to detect trends in surface water, moisture, and vegetation productivity, aerial imagery change detection (1958 and 2014) quantified shifts in the size and distribution of waterbodies, and field sampling investigated factors contributing to observed changes. The impact of expanding lesser snow goose populations on observed changes in surface water was investigated using the aerial imagery change detection of 2409 waterbodies and an information theoretic model selection approach, while their impact on vegetation was assessed using data from field surveys. Our analyses show that the pond complexes of western Banks Island are drying, having lost 7.9% of the surface water that existed in 1985. This loss of surface water disproportionately occurred in smaller sized waterbodies, indicating that climate is the main driver. Model selection showed that intensive occupation of lesser snow geese was associated with more extensive drying and draining of waterbodies and suggests this intensive habitat use may reduce the resilience of pond complexes to climate warming. Evidence from field surveys suggests that snow goose foraging is also contributing to patches of declining vegetation productivity within drying wetland areas. Diminishing and degrading high Arctic pond complexes are likely to alter permafrost thaw and greenhouse gas emissions, as well as the habitat quality of these ecosystems. Additional studies focused the mechanisms of surface water loss, the direct impacts of wetland drying on vegetation, and the contributions of snow geese to these processes, are necessary to better understand the changes occurring on Banks Island.