KEVIN KEYS
BScF (Forest Resource Management), University of British Columbia, 1990
MScF (Forest Soils), University of New Brunswick, 1995

DEPARTMENT OF BIOLOGY

TITLE OF THESIS:	**IMPACTS OF ALKALINE-TREATED BIOSOLIDS ON SPRUCE PLANTATION SOILS AND VEGETATION IN NOVA SCOTIA, CANADA**
TIME/DATE:	10:30 am, Wednesday, February 14, 2018
PLACE:	Room 3107, The Mona Campbell Building, 1459 LeMarchant Street

EXAMINING COMMITTEE:

Dr. Michael Rutherford, Environmental Science Program, University of Northern B.C. (External Examiner)

Dr. Gordon Price, Department of Engineering, Faculty of Agriculture, Dalhousie University (Reader)

Dr. Tony Walker, School of Resource and Environmental Studies, Dalhousie University (Reader)

Dr. Peter Duinker, School of Resource and Environmental Studies, Dalhousie University (Supervisor)

Dr. David Burton, Department of Biology and Department of Plant, Food, Environment in the Faculty of Agriculture, Dalhousie University (Supervisor)

DEPARTMENTAL REPRESENTATIVE:	Dr. Paul Bentzen, Department of Biology, Dalhousie University
CHAIR:	Djordje Grujic, PhD Defence Panel, Faculty of Graduate Studies

ABSTRACT

Decades of acid deposition in northeastern North America has resulted in base cation (Ca, Mg, K) loss and increased Al concentrations in many forest soils across the region. In Nova Scotia, Ca has been identified as a potentially limiting nutrient affecting current or future forest productivity in many areas – especially plantation sites where nutrient demands are increased due to intensive management. The use of liming amendments may be one way to compensate for current or future Ca deficits, but there is little history of such amendment use in northeastern North America and none in Nova Scotia. In this study, the possibility of using alkaline-treated biosolids (ATB) on spruce plantations was investigated. It was hypothesized that ATB could be a good source of Ca in Ca-limited sites, while also providing an environmentally sound end-use for this waste-stream product.

Through field and greenhouse trials, it was found that ATB can increase soil Ca and base cation / Al ratios in Ca-limited sites, while also increasing forest floor pH and reducing exchangeable Al^{3+} concentrations. In addition, treatments did not result in any significant accumulation and/or leaching of NO_3^- or trace metals, nor to any impact on ground vegetation abundance or diversity in the juvenile plantations assessed. It did, however, improve Ca, K, P, and Mn concentrations in white spruce crop tree foliage, while also slightly increasing diameter increment.

With appropriate consideration of soil and site characteristics, use of ATB could be an effective way to offset current or future Ca deficits associated with base cation depletion and intensive harvesting in Nova Scotia spruce plantations, but it may not result in any short-term increases in yield due to lack of significant impact on N availability and/or the presence of other limiting nutrients. In addition, ATB is a poor source of Mg, and the possibility of creating major Ca:Mg imbalances and/or inducing Mg shortages needs to be addressed when applying ATB to plantation soils