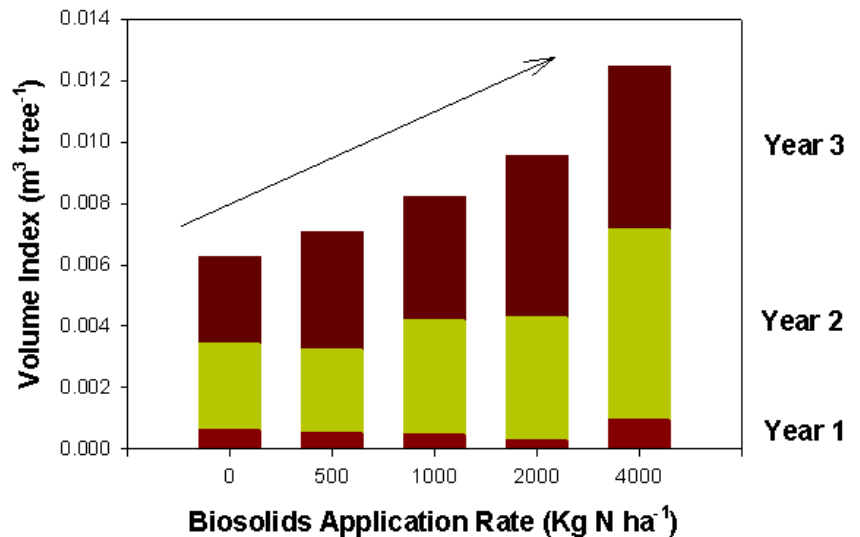


Growth Response of Biosolids Fertilized Hybrid Poplar

Researchers and Collaborators

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Background

As nitrogen is often the nutrient that limits growth in short rotation hybrid poplars, nitrogen additions are common. Nitrogen can be added through inorganic fertilizers such as ammonium nitrate or ammonium sulphate or through the addition of organic materials such as biosolids or farmyard manure. Nitrogen (N) fixing species, including species of legume, clover and alder add N to a site. The objective of applying biosolids to hybrid poplars is to use the biosolids inherent characteristics those being its fertilizer value and or organic nature, to accelerate the growth of the trees to which the material is being applied. Conserving the N available in the biosolids for tree uptake is key in utilizing the mineral nitrogen pool available for the trees to take up and grow. Accelerating the growth of the hybrid poplars will result in the ability to produce more fibre per unit area over a shorter period of time.

Objectives

The objective of this study was to assess the response of the hybrid poplar as measured by height, diameter and volume changes to different biosolids application rates and methods. The assessment of growth response is one part of a larger study exploring nitrogen dynamics and growth response of hybrid poplar and understory vegetation to biosolids fertilization.

Methods

Biosolids or paper fibre were applied once in 1994 using agricultural rear discharge manure spreaders on the surface or incorporated into a rising 3-year-old hybrid poplar plantation on Carey Island, near Chilliwack, British Columbia. The study design is composed of six treatments: control, paper fibre, and biosolids at 500, 1000, 2000 and 4000 kg N ha⁻¹. Growth response was assessed for three years post application through repeated measurements of diameter and height and volume calculations thereof.

Results

The application of biosolids resulted in an increase in hybrid poplar volume, and this volume increased with increasing application rate. In the first three years following treatment, the application of biosolids at 500 and 1000 kg N ha⁻¹ resulted in a 16% increase in volume over that of the control treatment. Biosolids applied at 2000 kg N ha⁻¹ resulted in a 38% increase. Biosolids applied at 4000 kg N ha⁻¹ returned a 34% increase in volume growth compared to the control. The paperfines resulted in a minimal change (3%) in tree volume. The decision to apply biosolids at the rising age was based on the assumption that within this growing season the trees would close canopy and nutrient demand would be highest. This did not occur. Canopy closure in the control occurred the subsequent year. Biosolids applications resulted in an increase in understory vegetation, which competed with the poplars for moisture during the summer moisture deficit.

Significance

The application of biosolids can result in significant increases in hybrid poplar volume. As is evident from the changes in hybrid poplar height, diameter and volume during the three growing seasons the management of understory vegetation and its concurrent competition for water and nutrients could provide the opportunity to achieve even greater volume increases. Applied at an optimum application rate in conjunction with appropriate management practices, biosolids have been shown to be an excellent hybrid poplar fertilizer, achieving significant increases in poplar volume. Using paperfibre as an understory vegetation mulch may also be successful and will be explored in a future research project.

Keywords: hybrid poplar, biosolids, growth response, application method, Populus, application rate, Scott Paper Limited, GVRD