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Overtopping vegetation and growth of Engelmann spruce seedlings

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Introduction

Mixed communities dominated by thimbleberry *(Rubus parviflorus* Nutt.) and fireweed *(Epilobium angustifolium* L.) occur after harvesting on a range of sites in the southern interior of British Columbia.

These communities may develop closed canopies up to 2 m tall within 5 years after forests are harvested. Reduced irradiance under these canopies and physical damage by vegetation can result in poor growth and survival of overtopped conifers.

Objective

To develop and evaluate techniques for assessing the effects of non-crop vegetation on the survival and growth of planted conifers.

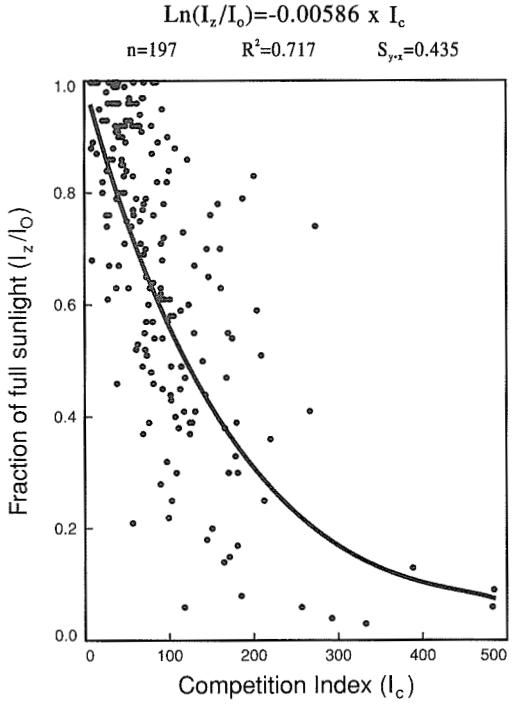
Methods

Neighbourhood studies have been established in 9 plantations in the Interior Cedar Hemlock biogeoclimatic zone of southern British Columbia. Relationships are being examined between survival and growth of Engelmann spruce *(Picea engelmannii* Parry ex Engelm.) seedlings and:

- % cover, height and proximity of neighbouring vegetation;
- irradiance at the top of seedlings.

Light Attenuation

The fraction of full sunlight reaching the top of a seedling decreases as competition index (I_c) increases.



$$(I_c = \Sigma(C_i \times H_i) / H_t)$$

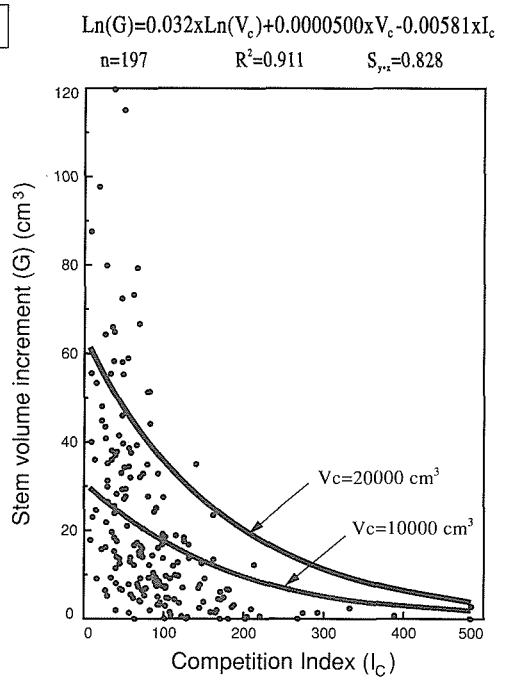
(C_i= % cover of species i; H_i= Height of species i; and H_t= seedling height; I_c is calculated for a 5 m^2 (1.26 m radius) plot centered on the crop seedling)

Seedling Growth

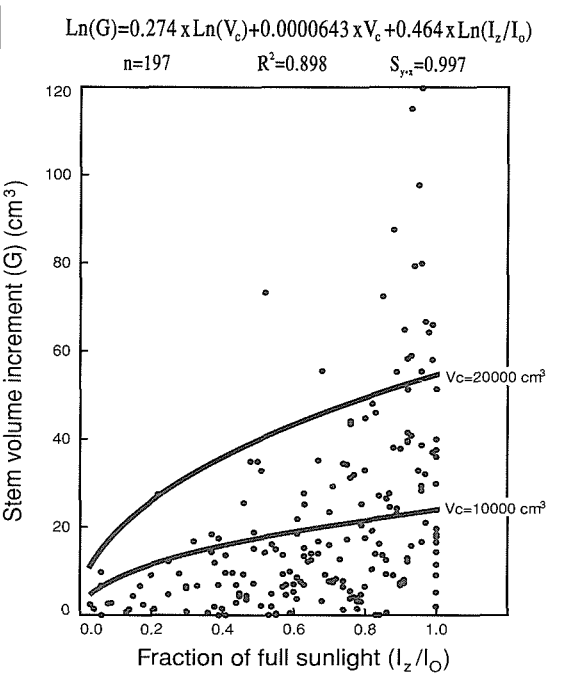
a) The growth of spruce seedlings increases as crown volume increases and decreases as competition index increases. Curves shown were calculated for seedlings with crown volume (V_c) of 10 000 and 20 000 cm^3.

b) The growth of spruce seedlings increases as the fraction of full sunlight (midsummer) reaching the top of the seedlings increases. The curves shown were calculated for seedlings with crown volume of 10 000 and 20 000 cm^3.

a)



b)



Conclusions

A simple competition index can be used to estimate the fraction of full sunlight reaching overtopped seedlings in these communities.

Competition index or measured levels of irradiance can be used, together with measurements of seedling crown volume, to predict the effects of overtopping vegetation on the growth of Engelmann spruce seedlings on these sites.

Continuing research will include collection and analysis of additional field data and development and refinement of competition models.

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