

Early Canopy Closure of Western Hemlock Seedlings
(Tsuga heterophylla (Raf.) Sarg.) to Reduce Competition by Salal
(Gaultheria shallon Pursh)
- A Comparison of Planting at Three Densities

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Establishment Report

SX Trial

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1.0 Introduction

Competition for nutrients and light (and perhaps allelopathic effects) by salal (Gaultheria shallon Pursh) is a serious problem in the northern Vancouver Island area, reducing the establishment and growth of plantations. On most sites in this area salal is present prior to harvesting. In the harvesting process very little is destroyed. Slashburning is the most frequently used method of reducing the salal, but the effectiveness lasts only approximately five years, depending on the intensity of the burn. If by this time the plantation crowns have not closed, salal invades quickly and reduces tree growth. Mechanical scarification on a total site scale is prohibitively expensive and mechanical spot scarification only controls salal for a relatively short time because it reinvades from the undisturbed areas. Both scarification processes are also restricted by terrain and accessibility.

Herbicides are being tested for efficacy against salal, however, currently in B.C. there is no registered herbicide that has been found to be effective against salal. Also, the strong lobby against herbicide application in forestry may prevent its use in many areas.

Salal is a light-requiring species. It does not grow vigorously beneath closed tree canopies where little light reaches the understory. Tree seedlings are currently being planted at a spacing of 2.4 meters and there is also ongoing discussions with regard to increasing the spacing to 3 m in order to reduce precommercial thinning requirements. With the combined effects of such wide spacing and of seedling growth delay due to planting shock, it takes several years for the canopy to close, providing ample time for the establishment of a dense salal cover. The abundant salal cover then becomes a competitor for light, moisture and nutrients, and may also exert an allelopathic effect on the seedlings, reducing their growth rate.

The planting of seedlings at a closer spacing is intended to reduce the time required for canopy closure, and thereby shade out the salal before it becomes densely established.

2.0 Objectives

The objective of this study is to compare tree growth (in terms of height,

root collar diameter, and crown diameter) and salal growth (in terms of percent cover and height), using three spacing densities: 1 m, 1.4 m and 3 m. The hypothesis is that the denser spacing will lead to a more rapid crown closure and ultimately to superior seedling growth by reducing the competition and the allelopathic effects produced by salal.

3.0 Methods of Investigation

3.1 Experimental Design

The study was laid out as a 7 X 7 seedling block totalling 49 seedlings per plot. A buffer strip was planted around the periphery of the 7 X 7 block, to maintain the effect of the spacing on the peripheral rows (Fig. 1).

3.2 Description of treatment

Three densities of spacing (1 m, 1.4 m and 3 m) were randomly assigned to the fifteen plots.

The 1 m spacing plots had a 7 X 7 seedling block with 3 m buffer strip comprised of three peripheral rows of seedlings.

The 1.4 m spacing plots had a 7 X 7 seedling block with an approximately 3 m buffer strip comprised of two peripheral rows of seedlings.

The 3 m spacing plots had a 7 X 7 seedling block with a 3 m buffer strip comprised of one peripheral row of seedlings.

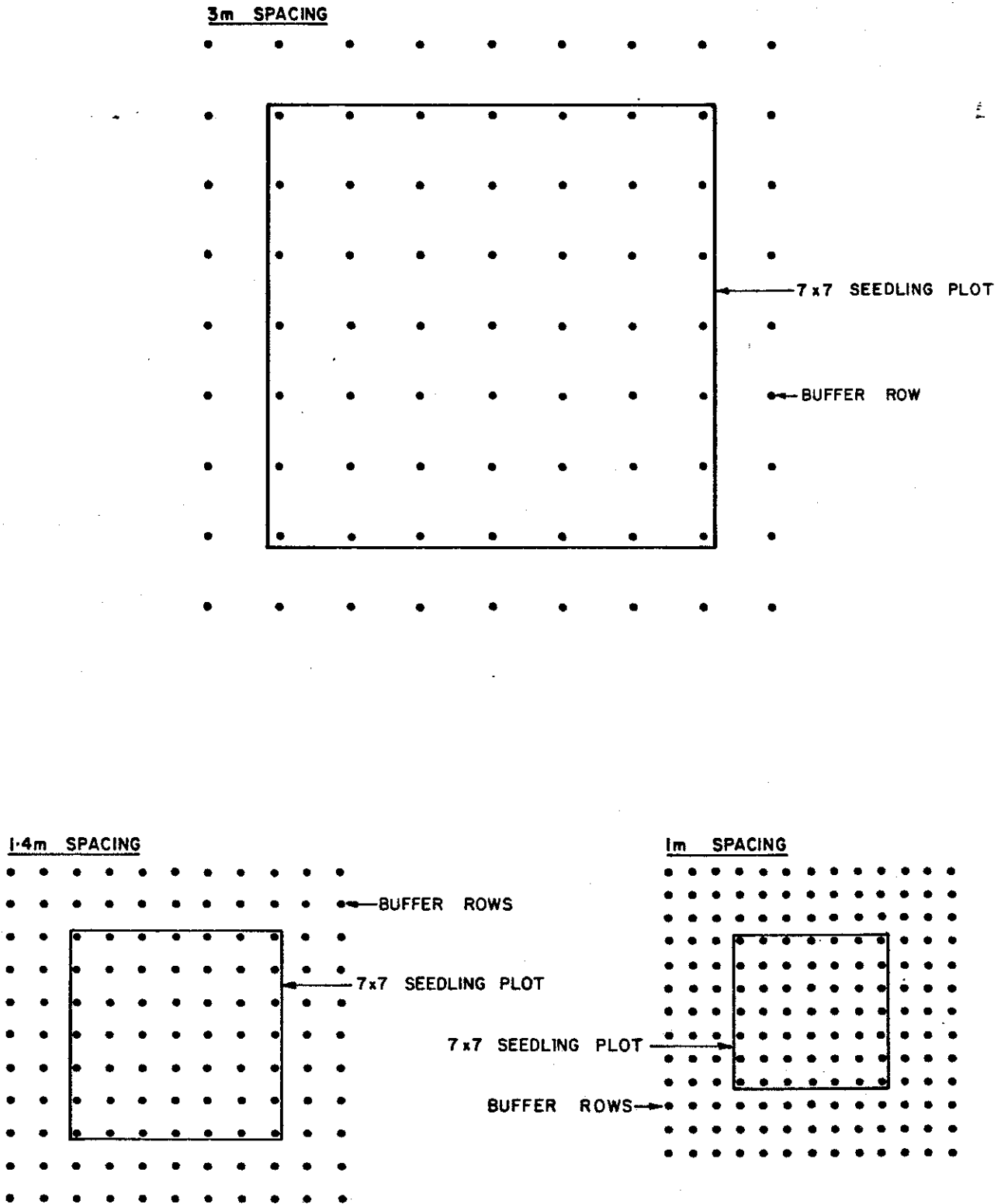
3.3 Site selection

The plots were randomly selected throughout the study area with the single constraint of avoiding disturbed or very wet ecosystems. Ecosystem uniformity in terms of moisture and nutrient regimes was a requirement.

3.4 Description of Site

The study area is located approximately 20 km northeast of Port Hardy at an elevation of less than 100 m a.s.l. The site lies on a south aspect and is in the Hypermaritime Coastal Western Hemlock Subzone (CWHd₁).

Figure 1



The ecosystem was identified as the Salal - Western Redcedar Plant Association.

The area is on a glaciofluvial terrace overlying basal till. Soils are predominantly loamy sand underlain by compacted sand at approximately 0.6 m below the surface. The humus form is a Lignohumimor, varying in depth between 1 and 30 cm.

The plots were restricted to the upper slope and mid-slope topographic positions as these are the most prone to salal domination.

4.0 Measures and Records

Assessment will be carried out to monitor seedling and salal growth, and to determine the time required to achieve crown closure for the three spacing densities. Each assessment will include:

- seedling diameter
- seedling height
- crown diameter
- percent cover of salal (within a 50 cm radius around the seedling)
- mean height of salal (mean height of the salal within the 50 cm radius)
- minimum distance of salal from seedling
- maximum distance of salal from seedling (to a maximum of 50 cm)
- percent of seedling overtopped by salal
- percent cover of deer fern (within a 50 cm radius around the seedling)
- mean height of deer fern (mean height of the deer fern within the 50 cm radius)
- minimum distance of deer fern from seedling
- maximum distance of deer fern from seedling (to a maximum of 50 cm)
- percent of seedling overtopped by deer fern
- name of 3rd species present within the 50 cm radius around the seedling
- percent cover of the 3rd species (within the 50 cm radius)
- mean height of the 3rd species (within the 50 cm radius)
- minimum distance of the 3rd species from the seedling

- maximum distance of the 3rd species from the seedling (to a maximum of 50 cm)
- percent of seedling overtopped by the 3rd species
- name of 4th species present within the 50 cm radius around the seedling
- percent cover of the 4th species (within the 50 cm radius)
- mean height of the 4th species (within the 50 cm radius)
- minimum distance of the 4th species from the seedling
- maximum distance of the 4th species from the seedling (to a maximum of 50 cm)
- percent of seedling overtopped by the 4th species.

Nine randomly selected subplots (1 m X 1/2 m) were located in each density plot. The percent cover of any vegetation species present in these rectangles was recorded.

5.0 Data Analysis

An Analysis of variance will be carried out to test for significant differences in diameter and height growth of seedlings, and in the amount of competing vegetation between the three spacing densities.

The ANOVA will be as follows:

<u>Factor</u>	<u>df</u>
S	2
P(S)	12
T(P*S)	720

Where: S = Spacing density

P = plot

T = trees

The vegetation recorded in the 1 X 1/2 m subplots will be assigned competition indices which will also be compared between the three spacing densities.

6.0 Roles and Responsibilities

The trial was established with the following personnel:

- K.L. Nuzdorfer, Assistant Research Ecologist, Ministry of Forests, Vancouver Forest Region
- F.C. Nuzdorfer, Research Ecologist, Ministry of Forests, Vancouver Forest Region
- Ministry of Forests, Port McNeill District staff

Tasks will be carried out as follows:

<u>Task</u>	<u>Time</u>	<u>Personnel</u>
Site Selection	Spring 1985	F. Nuzdorfer, Port McNeill District staff
Trial Establishment	Spring 1985	F. Nuzdorfer, K. Nuzdorfer Port McNeill District staff
Field Assessment (all years)	Spring 1985 (initial assessment) Fall 1985 (after 1st growing season) Fall 1989 (after 5th growing season) Timing of further assessments will be determined based on the 5th year results.	K. Nuzdorfer, F. Nuzdorfer Port McNeill District staff
Data Analysis	after each assessment	K. Nuzdorfer
Progress Report	after each assessment	K. Nuzdorfer, F. Nuzdorfer
Final Report	after final assessment	K. Nuzdorfer, F. Nuzdorfer

Research
K. L. Nuzsdorfer

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Project Title: Early Canopy Closure of Western Hemlock Seedlings (Tsuga heterophylla (Raf.) Sarg.) to Reduce Competition by Salal (Gaultheria shallon Pursh) - A comparison of planting at three densities.

Officer i/c: K. L. Nuzsdorfer

Location: 20 km northeast of Port Hardy

District: Port McNeill Forest District

Objective: To compare tree growth (in terms of height, root collar diameter, and crown diameter) and salal growth (in terms of percent cover and height), using three spacing densities: 1m, 1.4m and 3m.

Status: Assessment after planting and one growing season has been carried out.

Report & Distribution: Silviculture Section (VFR)
Ministry of Forests District Silviculturists
Research Branch
Company Silviculturists

Incomplete

September 1986