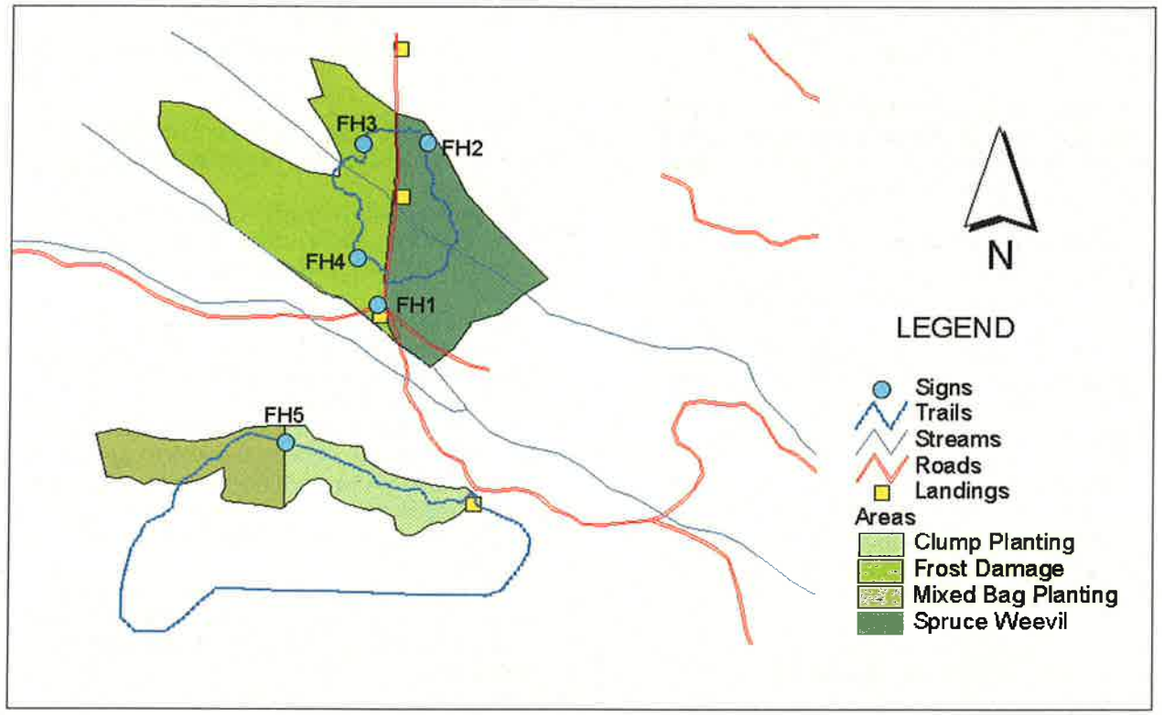

SIGNS

FH1 General Presentation
FH2 Spruce Weevil
FH3 Dieback of Established Douglas-fir Plantations
FH4 Summer Frost Damage
FH5 Control of Spruce Weevil Damage

UBC Alex Fraser Research Forest
Forest Health Trail

For more information contact:
The UBC/Alex Fraser Research Forest
Tel. 392-2207/296-3469

Please Do Not Disturb Symptomatic Trees or Research Installations

CONTROL OF SPRUCE WEEVIL DAMAGE BY INTRODUCTION OF ALTERNATE COMMERCIAL SPECIES

This trial was established to look at the practicality of establishing spruce plantations with a mixture of other commercial species as a foil for spruce weevil. This site was burned in 1971, logged in 1972 and planted in 1974. A 1990 survey declared the area non-productive brush. The area was site prepared in 1992, using a cat with a brush blade, and planted in 1993.

TREATMENT 1:
Mixed Bag Planting 2.3 ha

An intimate mixture of lodgepole pine and spruce were block planted at a density of 1800 stems/ha. Optimum inter-tree spacing was 2.5 m, with a minimum distance of 1.5 m.
Manual brushing was completed in 1997.

TREATMENT 2:
Mixed Clump Planting 2.3 ha

Trees were planted in clumps - 300 clumps per hectare - 7 trees per clump, (4 Pl and 3 Sx). Optimum inter-tree distance within the clump is 1 m.
Manual brushing was completed within clumps in 1997.

Anticipated benefits:

- spruce will be overtopped by the lodgepole pine and adjacent deciduous species
- the taller lodgepole pine and adjacent deciduous will hide the shorter spruce trees
- the rapid nutrient uptake and cycling by the pine and deciduous will benefit the spruce
- brush control need only take place within clumps, and deciduous cover will be left between clumps
- increased component of deciduous will provide biodiversity
- deciduous trees such as birch, aspen and cottonwood will be available for harvest in commercial thinning

Spruce weevil attack and the growth will be monitored over time in each treatment area.

ALEX FRASER RESEARCH FOREST
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FOREST RENEWAL BC
A British Columbia Crown Corporation

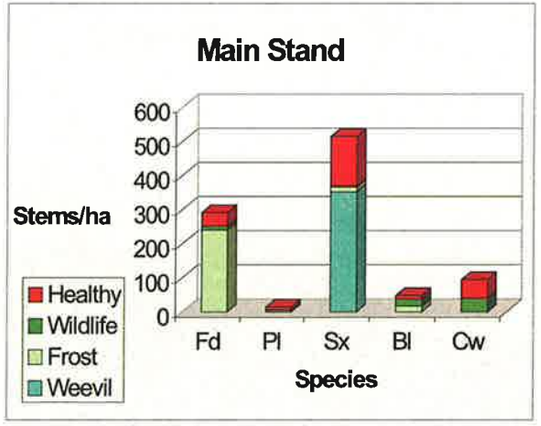
An Extension Strategy for
UBC/Alex Fraser Research Forest

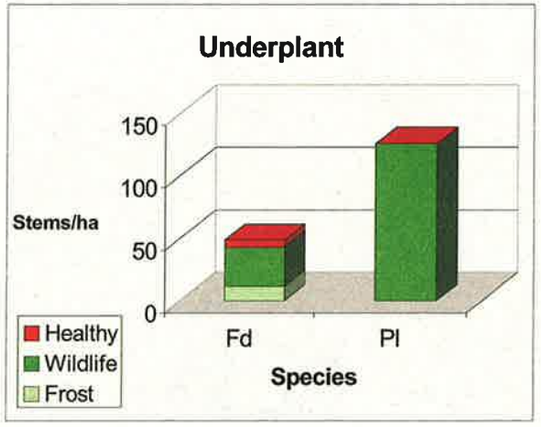
FOREST HEALTH TRAIL
"The Walk of Doom"

INTRODUCTION

Weather, mammals and diseases are all natural features of forest sites. Silviculturists must recognize these "forest health factors" in order for silviculture treatments to be economical and successful.

This trail explores a variety of forest health factors that were not recognized in the treatments prescribed for this particular area.





STAND HISTORY

This site was logged in 1971, burned in 1972 and planted in 1978 with spruce on the east side of the road and Douglas-fir on the west side of the road. In 1990 this site was declared non-sufficiently restocked (NSR) due to a high incidence of spruce weevil damage and Douglas-fir frost damage.

In 1992-1993, 12.6 ha were underplanted with lodgepole pine and Douglas-fir to increase the stocking level of the stand. Since planting, repeated browsing by red back vole and snowshoe hares damaged the underplanted seedlings.

The 1998 survey results below show the percentage of damage in the main 20 year old spruce/fir stand and the underplanted 5 year old pine/fir seedlings.

SPRUCE WEEVIL

Spruce terminal weevil is an insect which damages many plantations of spruce and pine throughout North America. In British Columbia the weevil attacks sitka, white and Engelmann Spruce trees, from 1.5 -10 m in height.

The weevil prefers vigorous, open grown trees. The attack causes terminal dieback of at least two years' growth and reduces timber quality by inducing forked and crooked stems.

Results from a project in a 13 year old neighboring spruce plantation indicate that a single attack caused a 5 year increment loss of 23%. In addition, it is taking more than five years for trees to regain "normal" growth following weevil attack. Many trees suffer repeated attacks. Weevil attacks tend to occur in clumps throughout plantations.

One of the main methods of host selection by the weevil is via the silhouettes created by the terminal leader. It is thought that weevils select the tallest and straightest leaders within the stand. If some side shade is created around the spruce trees with a resistant species, the occurrence of attack may be reduced within the stand, due to the masking of the trees' leaders.

DIEBACK OF ESTABLISHED DOUGLAS-FIR PLANTATION

In 1986, wide-spread dieback of Douglas-fir in plantations was noted throughout the Cariboo. The problem was investigated by UBC student Richard Reich and Professor B.J. van der Kamp.

Aphid feeding sites or other damage to bark tissue are invaded by weakly pathogenic fungi. As long as the tree remains in good health, these fungi cannot spread. When the terminal buds of the tree are killed, however, the tree temporarily loses hormonal control of its tissues. The weak pathogens can then invade the bark, and all the parts of the tree above the infection point are killed.

The dieback was initially called "Sclerophoma dieback" because Sclerophoma was found fruiting on dead bark, but the fungus was largely restricted to tissues already killed by other agents such as frost or proximal cankers.

To minimize the damage:

- stratify frost pockets using aerial photographs and field assessments before harvesting
- accurately map landforms conducive to frost pooling
- block layout should allow cold air drainage, to avoid creating artificial frost pockets
- plant lodgepole pine in frost pockets identified on the ground and from terrain and cutblock features visible on aerial photographs.

SUMMER FROST

(based on a study by Ordell Steen, MOF Cariboo Region)

Summer frost can be a major cause of impaired growth and high mortality in conifer seedling plantations.

Radiation cooling usually occurs on calm, clear nights when heat radiates from ground and vegetation surfaces, cooling the air close to the ground.

Advection frost occurs when cold air created by radiation frost, flows downhill and collects in low-lying areas where further radiation cooling can lead to temperatures below 0°C.

Cold air settles in depressions where it collects and forms frost pockets. Obstructions which impede cold air flow can form localized frost pockets. Even small hollows and depressions can collect cold air which increases the risk of frost damage on individual planting microsites.

Tall, dense shrubs and the forest stand canopy in partial cuttings, work as protective layers, which appear to considerably reduce the frost hazard for seedlings.

The species most sensitive to frost damage is Douglas-fir, which occasionally suffers damage and isolated mortality on low hazard sites. Lodgepole pine is comparatively frost tolerant, being the only species to survive and grow on very high hazard sites. Spruce, hemlock, cedar and subalpine fir, are somewhere in-between Douglas-fir and lodgepole pine, occasionally suffering damage and isolated mortality on the medium hazard sites.

The summer frost tolerance of conifer seedlings appears to be both genetically and environmentally controlled.

Cold air pooling