Sx Trial Summary

Title: Conifer tolerance to Vision herbicide application in the year of planting

Officer l/c: G. Harper, P. Comeau, B. D'Anjou

Location: Brett Creek, Harrison Lake

Region/District: Vancouver/Chilliwack Forest District

Objective: To acquire and report data on conifer tolerance to application of VISION (glyphosate) herbicide during the year of planting. Treatments will consist of a) an untreated control b) VISION application (late August of the year of planting) at 1.0 kg a.i./ha, c) VISION application (late August of the year of planting) at 1.5 kg a.i./ha and d) VISION application (late August of the year of planting) at 2.0 kg a.i./ha.


Next scheduled Assessment/Treatment: Trial to be established August 1993.

Report Distribution: Working Plan/Sx Trial Coordinator - Curt Clarke
George Harper - Research Branch
Phil Comeau - Research Branch
Brian D'Anjou - Vancouver Region, Forest Sciences
Jacob Boateng - Silviculture Branch, Victoria
Mel Scott - Stand Tending Forester, Vancouver Region
Ron Gladiak - Vegetation Management Technician, Chilliwack District
Library - Silviculture Branch
Vancouver Region - Library
Chilliwack Forest District - Library
Working Plan for Sx Trial - Conifer Tolerance to VISION Herbicide Application in the Year of Planting

Introduction

The use of VISION (glyphosate) herbicide during the year of planting as a post plant treatment is gaining interest in forestry as an operational vegetation management tool. Data on conifer tolerance to post plant VISION treatments during the year of planting is required as a basis for label amendments, if study results indicate that such amendments are acceptable.

A review of available information has turned up the results from only two studies conducted in British Columbia (Barker 1985, Herring 1988). Barker (1985 and 1987) noted some terminal bud damage, foliage browning and minor volume reductions in 1+0 plug Sitka spruce seedlings subjected to approximately 1.3 kg a.i./ha glyphosate however, other stock types within the same study were not damaged. Herring 1988 reported "substantially better seedling (white spruce) recovery and growth on sprayed plots compared to controls" six years after glyphosate application (2.4 kg a.i./ha). Additional trials are required, and should focus on conifer species such as Douglas-fir and interior spruce. The proposed Sx trial will focus on Douglas-fir and will be conducted in the Chilliwack Forest District, Vancouver Forest Region. It has been initiated as a collaborative effort between Regional Research Silviculturists, Research Branch staff and Regional Vegetation Management Specialists. A similar study focusing on spruce tolerance to VISION will be initiated in 1993 by Andrea Eastham (Forestry Canada) and Ian Moss (Northwoods).

Note, results from a single study are applicable to that site only and repeated studies located at different sites are necessary to increase the confidence in generalizing results. Conifer tolerance may be affected directly, or in interaction with, a host of factors other than the treatments. Site variation in stock quality, stock development, climate, soil nutrient and moisture regime, vegetation competition, soil type, etc. may influence conifer tolerance to VISION herbicide treatments.

1. Objectives

To acquire and report data on conifer tolerance to application of VISION (glyphosate) herbicide applied as a post plant treatment during the year of planting.

To assess the effectiveness of VISION (glyphosate) herbicide applied as a post plant treatment during the year of planting.

2. Location

Brett Creek, Harrison Lake, Fraser TSA, TSL A39517, Block A, Opening No. 92H031-23 A, Chilliwack Forest District, Vancouver Region.

3. Trial Stock

<table>
<thead>
<tr>
<th>Crop Species</th>
<th>Seedlot No.</th>
<th>Stock Type</th>
<th>Code</th>
<th>Nursery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fdc</td>
<td>6365</td>
<td>BBR-L</td>
<td>2+0</td>
<td>Surrey</td>
</tr>
</tbody>
</table>

(unit K - Silv. Project Map 93V01-04)
4. Plot Design and Stock Requirements

Treatments will consist of a) an untreated control b) VISION application (late August of the year of planting) at 1.0 kg a.i./ha c) VISION application (late August of the year of planting) at 1.5 kg a.i./ha and d) VISION application (late August of the year of planting) at 2.0 kg a.i./ha. Each treatment will be replicated 5 times. Replicates will consist of strip plots (4 m X 30 m) located across the contour of the landscape with a 4 m buffer located between plots. Treatments will be randomly assigned to plots. Within each plot, 10 planted Douglas-fir (Fde) seedlings will be tagged for conifer tolerance measurements and tree centered vegetation assessments (1.0 m radius). Conifer height, diameter, survival, foliage and stem condition will be assessed. Vegetation assessments will included % cover and height of major species. The treatment area will be located within a relative homogenous portion of the block where vegetation height is less than that of the seedlings to maximize conifer exposure to the herbicide application.

Statistical analysis will include ANOVA and planned contrasts.

Analysis of Variance Table (ANOVA)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Factor Type</th>
<th>Level</th>
<th>degrees of freedom (d.f.)</th>
<th>Expected F-test (d.f.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>treatments T</td>
<td>fixed</td>
<td>4</td>
<td>3</td>
<td>MS treatments (3,16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MS plots</td>
</tr>
<tr>
<td>plots P(T)</td>
<td>random, nested</td>
<td>5</td>
<td>16</td>
<td>MS plots (16,180)</td>
</tr>
<tr>
<td>seedlings S(PT)</td>
<td>random, nested</td>
<td>10</td>
<td>180</td>
<td>MS seedlings</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>199</td>
<td></td>
</tr>
</tbody>
</table>

Planned Contrasts

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Coefficient: a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>control vs glyphosate@1.0 kg a.i./ha</td>
<td>1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>control vs glyphosate@1.5 kg a.i./ha</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>control vs glyphosate@2.0 kg a.i./ha</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>control vs glyphosate (1.0 + 1.5 + 2.0 kg a.i./ha)</td>
<td>3</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>glyphosate@ 1.0 kg a.i./ha vs 1.5 kg a.i./ha</td>
<td>0</td>
<td>1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>glyphosate@ 1.0 kg a.i./ha vs 2.0 kg a.i./ha</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>glyphosate@ 1.5 kg a.i./ha vs 2.0 kg a.i./ha</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>-1</td>
</tr>
</tbody>
</table>

5. Assessment Dates

Seeding assessments will be made immediately prior to treatment application (late August, 1993) and during the fall of 1993, 1994, and 1995 (see Appendix for condition codes).

Vegetation assessments will be made prior to treatment application (late August, 1993) and the summer of 1994 and 1995.
6. Summarize and Report

First and second year results will be reported in ECW Abstracts in 1994 and 1995. Interim and final reports will be produced.

7. Report Distribution

Interim and final reports will be forwarded to the Regional Silviculture Officer. First and second year results will be reported in ECW Abstracts in 1994 and 1995.

References

Barker, J.E. 1987. Re-establishment techniques for high site alluvial (S4) land in coastal B.C. Final Report, Section 88 Contract Number NV99032 to Western Forest Products Limited. Western Forest Products Limited, Vancouver, B.C.


Appendix

1. Crop Seedling Assessment

Seedling height - the current total height to the nearest 1 cm.

Stem diameter - measured at approximately 1 cm above ground level to the nearest 0.01 cm.

Seedling condition - foliage condition, leader shoot condition, stem condition and damage cause will be noted using condition codes from Herring and Pollack 1985.

Seedling tolerance - the degree of crop seedling tolerance will be assessed on the degree of topkill and use a 0-100 rating scale as recommended for the purposes of the Expert Committee on Weeds Research Abstracts (Pollack and Herring 1985). A linear relationship is intended with 0 indicating no visible damage and 100 the death of the crop tree. Several seedling parameters will be recorded for tolerance assessment:
   a) number of terminal and lateral tip buds visibly necrotic or healthy
   b) ratio of seedling height of healthy stem tissue to seedling total height (healthy and damaged stem tissue) (undamaged seedling will have a ratio of 1.0, visible stem damage = ratio < 1.0)
   c) % of the seedling with foliage damage (browning, chlorosis, necrosis, etc.) and % of each needle age class with foliage damage (1992 + 1993)
   d) visible foliage (needle) damage will be assessed on an average damaged needle/seedling and an average damaged current year needle/seedling; the proportion (%) of the needle damaged, and the type of injury (damage codes).

2. Vegetation Assessment

Vegetation species height - the mean, top height to the nearest 1 cm of each major species located within the seedling centered subplot (1.0 m radius).

Vegetation species % cover - estimated to the nearest 5% the percent cover of each major species within the seedling centered subplot.
Folliage Condition Code
H - No visible effect (healthy)
Y - Chlorotic (yellow)
M - Mottled
N - Necrotic
A - Needles absent, defoliated
B - Browsed
D - Dead buds on lateral branches
0 - Other symptoms (specify)

Leader Shoot Condition Code
H - No visible effect (healthy)
C - Curled
F - Forked
B - Browsed
T - Dead terminal bud
S - Snapped, broken
A - Absent, missing
0 - Other symptoms (specify)

Stem Condition Code
H - No visible effect (healthy)
P - Bark peeled or abraded
B - Stem bent
S - Stem smashed, crushed, trampled
C - Stem cut, clipped, broken
D - Tree dead, dying
M - Tree missing
0 - Other symptoms (specify)

Damage Cause Code
A - None
H - Herbicide
M - Mechanicai equipment
T - Hand tools
S - Falling slash (human caused)
X - Falling or sliding debris
E - Climate - frost
N - Snow press
V - Vegetation press
W - Climate - drought
R - Rodents, small animals
B - Big game
L - Livestock
F - Fire
I - Insects
D - Disease
U - Other (specify)
U - Unknown
Crop Seedling Assessment Form

<table>
<thead>
<tr>
<th>seedling tag number</th>
<th>total height</th>
<th>diameter</th>
<th>condition</th>
<th>num. healthy buds</th>
<th>num. necrotic buds</th>
<th>healthy stem height</th>
<th>ratio healthy ht./total ht.</th>
<th>% of seedling with foliage damage</th>
<th>average % of needle damaged</th>
<th>needle injury type/comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm</td>
<td>mm</td>
<td>foliage</td>
<td>leader</td>
<td>stem</td>
<td>cm</td>
<td>entire foliage</td>
<td>1992 foliage</td>
<td>1993 foliage</td>
<td>1992 needle</td>
<td>1993 needle</td>
</tr>
</tbody>
</table>


Vegetation Assessment Form

Plot: 
Assessment Date: 
Plot Radius: 

<table>
<thead>
<tr>
<th>Tree #</th>
<th>Sp.</th>
<th>% Cover</th>
<th>Ht Top (cm)</th>
<th>Ht Avg (cm)</th>
<th>Dist. Near (cm)</th>
<th>Dist. Avg. (cm)</th>
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