SX 82401 C

Strip Thinning of Juvenile
Lodgepole Pine
J. Perry

Working Plan
WORKING PLAN

Strip Thinning of Juvenile Lodgepole Pine

1.0 Introduction

Lodgepole pine clearcuts and burned-over areas often fill in with excessive densities of over 20,000 stems per hectare of pine regeneration. Initial density control is necessary to avoid repression of these stands. The purpose of this project is to experiment with various types of narrow-width strip thinning equipment to find an effective and inexpensive means of reducing stand densities. Cut and leave strips will be produced by strip thinning sample clearcuts of pine regeneration less than 1.5 metres in height and 10 years of age (see also Section 4.0 - Selection of Treatment Areas).

The main objective of this SX trial is to confirm whether or not it is possible to reduce the cost of selective hand spacing in the future by implementing initial density control at an early stage of stand development. The hand spacing costs would be expected to decrease due to the improved access into the stand as well as area for slash disposal developed throughout the cutblock by the strip thinning treatment. It is necessary that the hand spacing costs for the strip thinned area be compared to the same treatment on a similar area. However, if potential stand repression can be avoided by this initial treatment, then the cost of strip thinning should be considered as a separate treatment, rather than as an introductory treatment to obtain a final product.
2.0 Trial #1 - Parallel Strip Thinning With Subsequent Hand Spacing

Density reduction in this trial will be achieved by drag scarifying parallel rows of cut strips measuring approximately 2 metres in width; leave strips will be 4 metres wide. The prime mover will be a Caterpillar D3, and drag scarification equipment behind the small V-boat will consist of a combination of shark fins and chains that can sufficiently wrench the seedlings from the ground to cause them to desiccate. On at least one hectare of the treated area, a one-metre wide swath on each side of the leave strip will be spaced by hand. At that time any unacceptable, damaged stems remaining in the cut strips can also be removed. The spaced edge trees are expected to overtop the central portion of the residual strip, thus further reducing the total area requiring hand spacing.

Strip thinning produces initial density control in the stand, as well as such benefits as area for slash disposal and access during manual spacing. The release of edge trees is likely, but not certain. The leave strip edges will be manually spaced two years after the strip thinning treatment in order to allow for the mortality of any edge trees damaged by the machinery before crop trees are selected. In addition, the scarified seedlings of the cut strip require time to fully desiccate before any remaining live, damaged stems need to be removed.

Trial 1: - drag scarify 2nd row 2m + leave 4m
- prime mover D-3 Cat. pulling V-boat
- drag scarifier

2 - as above using 2 sets of 1 drag scarified strips crossing at a 45° angle

Selection of treatment areas - see page 4.

Working plan in our file? 3/1. . .
3.0 Trial #2 - Diamond-Patterned Strip Thinning

Density reduction in this trial will be entirely mechanical using the D3 and combination drag scarification equipment as in Trial #1. Two sets of parallel, scarified strips will be produced, with the second series of strips crossing the first series at an angle of 45° or less. An area of small diamond-shaped leave blocks will remain:

This method has the advantage over strip thinning perpendicularly to the first set of lines in that the total length of edge is increased, thus reducing intra-specific competition among more of the remaining crop trees.
4.0 Selection of Treatment Areas

The lodgepole pine cutblocks chosen for the strip thinning treatments are to be representative of the types of areas on which such a treatment will be required as an established stand tending treatment. The ecosystems best suited to this type of treatment range from xeric to mesic in the IDFb and SBSa biogeoclimatic subzones. The blocks chosen for the trials must have the following features:

1. healthy, predominantly lodgepole pine regeneration
2. minimum average density of 10,000 stems/hectare*
3. regeneration less than 1.5 metres in height and 10 years in age
4. stocking as homogenous as possible for lodgepole pine (expected to be patchy)
5. minimal densities of hardwood species expected to sprout or sucker after disturbance
6. maximum slope of 10%
7. low amounts of slash

* The density in a pine cutblock of this age is expected to increase over time due to ingress.
5.0 Sampling

5.1 Pre-Treatment for Trials #1 and #2

Treatment blocks for both Trials #1 and #2 will be flagged out and the area measured using latitudes and departures for multi-sided blocks or length multiplied by width for rectangular blocks. The pre-treatment sampling frequency will be two 2.52-metre radius (1/500 hectare) plots per hectare to be treated. The following measurements will be recorded for each plot on the Pre-Stand Tending Survey form (F.S. 748 SIL 80/2):

1. density
2. height (cm) and diameter (mm) of the 5 tallest, healthy pine stems in that plot
3. slope
4. amount of slash
5. amount of brush
6. height, diameter and density of any other species
7. animal, disease or insect signs or symptoms

From this information a summary table can be made for comparing density averages and ranges, heights, diameters and stand vigour for the blocks selected for treatment.

5.2 Post-Treatment Sampling

The objective in the post-treatment sampling is to accurately assess whether or not the drag scarification equipment pulled by the D3 is capable of killing all stems in the scarified strips, while inflicting minimal damage to the edge trees of the residual strips. Post-treatment sampling for the two trials will be discussed separately, but have in common the following four criteria to be assessed:
(i) **Seedling mortality in cut strips** is important to these trials as it will aid in determining the thoroughness and effectiveness of the strip thinning method under the specific conditions as outlined in Section 4.0 - Selection of Treatment Areas. All damaged, healthy and resprouting stems will be tagged, numbered and tallied. An accurate plot area measurement will be used in calculating the remaining stems per hectare of cut strip.

(ii) **Damage to edge trees** will be measured by tagging and numbering damaged stems in order to monitor damage status and tree vigour status over time. Damage and tree vigour classes are as follows:

**Damage Classes**

1 - light (only a small portion of the stem has been scraped)
2 - medium (stem and branches have been scraped)
3 - heavy (a large part of the stem and branches has been damaged and/or the tree's form has been altered)

**Tree Vigour Classes**

1 - good (tree is expected to recover, or, in the case of later sampling, has recovered from damage with minimal growth loss)
2 - reduced vigour (height growth reduction, stunted needles, and/or chlorosis)
3 - dead

(iii) **Strip width consistency** (the 2 metre - 4 metre relationship of cut strip and leave strip, respectively) will be evaluated for both trials using one randomly-located transect per block, perpendicular to the cut and leave strips. The transect will cross ten cut and leave strips; therefore, the total length is expected to be about 60 metres. Each cut and leave strip width will be measured using
a 50-metre length chain.

(iv) **Height and diameter response** is an interesting addition to the intrinsic data obtained from these operational trials. The objective of these measurements is to prepare height and diameter profiles that show changes in tree growth according to distance from a point where the greatest amount of release is expected. These results will hopefully yield more information on optimum leave strip width for this type of strip thinning treatment.

The two trials require separate, further discussions of details for post-treatment sampling.

5.2.1 Trial #1

The permanent plot for the parallel strip thinning trial will measure ten metres times the width of the cut strip, which is expected to be two metres. One plot will be established for every two treated hectares, with a minimum of two plots per block. The transect for measuring height and diameter response will run perpendicularly from the most southerly corner of one plot per block across to the next cut strip.

All other sampling details are included in the preceding general discussion.

5.2.2 Trial #2

The small, diamond-patterned leave blocks create some difficulties in sampling the effectiveness of the treatment. This trial involves a second pass of strip thinning over the parallel rows and is expected to produce different conditions from Trial #1. Consequently, post-treatment sampling for Trial #2 will be specific for this method and will not repeat any of the measurements taken for Trial #1.
Seedling mortality in the cut strips will be measured at one randomly-selected junction of two cut strips for each treated hectare of the block. The assessment of remaining stems in areas that have been treated twice will yield information on how more effective a double pass of the scarification equipment is over the initial single pass. The plots will measure approximately 2 metres by 2 metres.

Edge tree damage will be assessed on the sides of the acute angles of the diamonds, to test whether or not the corners are more susceptible to damage by the scarification equipment than are the edges of the parallel leave strips in Trial #1. One set of measurements will be taken at one of every two of the above plots, with a minimum of two plots per block. A set of measurements will consist of assessing the two leave block edges beginning at each of the two diamond apices and extending five metres back. Damaged tree data will include the distance of each tree from the apex of the diamond. A total of 20 metres of edge will be assessed for damaged stems at each of these plots.

The strip width consistency will follow a transect crossing the second series of strips produced during the treatment. This will test any difficulty in superimposing a second series of scarification strips over the first.

The height and diameter assessment in Trial #2 will measure growth changes at an edge preferably with no damage, or, if some damage has occurred throughout the treated block, at an edge with damage and tree vigour classes of 1 only (see Section 5.2). The transect will begin at the apex of a leave block and proceed along the edge to the next corner. The distance from the apex will be recorded for all measured stems.
5.3 Summary of Post-Treatment Sampling Methods

<table>
<thead>
<tr>
<th>Type of Assessment</th>
<th>Trial #1</th>
<th>Trial #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Seedling mortality in</td>
<td>- measuring the success of one pass over area</td>
<td>- measuring the success of two passes over area</td>
</tr>
<tr>
<td>cut strips</td>
<td>- plot size = cut strip width X 10 m = approx 20 m²</td>
<td>- plot size = cut strip width X cut strip width</td>
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<tr>
<td></td>
<td>- plot frequency = 1 per 2 ha</td>
<td>= approx 4 m²</td>
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<tr>
<td></td>
<td></td>
<td>- plot frequency = 1 per ha</td>
</tr>
<tr>
<td>2. Damage to edge trees</td>
<td>- measured at leave strip edges of all of the above plots</td>
<td>- measured on 5 m edge leading from opposite diamond apices in every</td>
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<tr>
<td></td>
<td>- total of 20 m assessed per plot</td>
<td>total of 20 m assessed per plot</td>
</tr>
<tr>
<td>3. Strip width consistency</td>
<td>- one transect per block, crossing 10 cut and leave strips</td>
<td>- one transect per block, crossing 10 cut and leave strips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- the second pass of strips will be assessed</td>
</tr>
<tr>
<td>4. Height and diameter</td>
<td>- across one leave strip</td>
<td>- along one leave block edge</td>
</tr>
<tr>
<td>response</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.0 Treatment Schedule

(i) Pre-treatment sampling - July 1982

(ii) Strip thinning treatment - August 1982

(iii) Post-treatment sampling - Fall 1982
    - Fall 1983 (1 growing season after treatment)
    - Fall 1984 (2 growing seasons after treatment)
    - Fall 1985 (3 growing seasons after treatment)
    - Fall 1987 (5 growing seasons after treatment)
    - Fall 1992 (10 growing seasons after treatment)

(iv) Manual spacing of Trial #1 - Fall 1984