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**Province of British Columbia**
Ministry of Forests

# PROPOSED AMENDMENTS TO THE REGENERATION SURVEY SYSTEM USED ON DRAG SCARIFIED LODGEPOLE PINE SITES IN THE PRINCE GEORGE FOREST DISTRICT

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## FOREWORD

During 1968, anchor-chain drag-scarification was introduced to the Prince George Forest District. In that year a number of small areas were treated. Acceptance of the technique as a method of promoting the natural regeneration of lodgepole pine has steadily grown, until in 1976 more than 7000 hectares were treated in this manner at an approximate cost of $400,000.

Regeneration surveys were conducted three to four years after logging on some of these areas. These surveys were designed solely to discriminate between satisfactory and unsatisfactory stocking. Stocking density was not recorded and it was not possible to relate stocking with season and method of logging and scarification or with type and weight of drag scarifier. More data are necessary to develop a reliable decision-making process on the application of drag scarification.

During 1977 two projects were initiated to provide information necessary to the development of a reliable decision-making process. The first was designed to relate the number of cones, the percentage of seedbed exposed by various drag attachments and the distribution and level of stocking five years after treatment. The second project was an extensive regeneration survey to provide information which could relate stocking levels with the major contributory factors associated with logging and scarification practices. This report presents the results of the survey and the recommendations of the authors.

## LOCATION

The surveys were done on various cutting permits and cutblocks which included approximately 28 Timber Sales in the Prince George S.S.A.'s and the Westlake and Nechako P.S.Y.U.'s. These areas are situated to the west and southwest of Prince George. The majority of sites inspected were within the area bounded by the Blackwater road, Clear Lake forest road, the Bobtail forest road and Highway 16 between Prince George and Vanderhoof.

Most of the sites selected for inspection were easily accessible, but a number could not be reached due to poor access.

## METHOD

| | |
|---|---|
| Plot size | $5m^2$ (r = 126 (cm) |
| Shape | Circular |
| Intensity | 4/ha |
| Pattern | Grid-type |

The plots were located every 50 m along compass lines which systematically covered the entire area. This intensity was not required on relatively uniform clearcuts larger than 40 or 50 ha. On these sites the plots were established on a 100 x 50 m (2/ha) grid system. The choice of intensity was left to the discretion of the field staff.

All regeneration within the plot was recorded by quadrant, which gave some indication of the seedling distribution within the plot. Post-logging regeneration and advance regeneration were tallied separately. Non-commercial species such as alder, aspen and willow together with any exposed mineral soil patches greater than 225 $cm^2$ were also recorded.

These data, together with any additional information pertaining to the season and method of logging and scarification, type and weight of drag attachments and the results of any previous regeneration surveys were compiled. However, previous regeneration surveys had been completed on only 30% of the surveyed sites and no information concerning drag weight was found.

## RESULTS

The paucity of areas drag-scarified before 1970, makes any general comparison of regeneration numbers with time since logging, highly speculative. However, earlier regeneration surveys had been completed on some of the areas drag-scarified before 1974. Most of these surveys were done on the basis of percent distribution* only, and therefore comparison of the actual stocking levels was not possible. Changes in the percent distribution with time for individual sites are shown in TABLE 1.

TABLE 1

PERCENTAGE STOCKING DISTRIBUTION 3.6 and 5.6 YEARS AFTER TREATMENT

| Timber Sale | CP or CB | Unit | Year Logged | Year Scarified | Year Inspected | Operational Survey & stocking | Check Survey % Stocking 1977 |
|---|---|---|---|---|---|---|---|
| 04583 | CP A | | F 71 | S 72 | May 74 | 19 | 75 |
| 00489 | B | 3 | W 70 | 71 | June 75 | 18 | 82 |
| 00536 | | Lot 1762 | 70 | 70 | June 74 | 40 | 72 |
| 00723 | | | W 69 | 69 | June 74 | 59 | 86 |
| 00723 | | | W 72 | 72 | June 74 | 2 | 71 |
| 00738 | CP A | CB 4 | W 71-2 | S 72 | May 75 | 30 | 77 |
| 00738 | CP A | CB 6 | W 71-2 | S 72 | May 75 | 39 | 83 |
| 00738 | CP A | CB 12 | W 72 | S 72 | May 75 | 46 | 71 |
| 00748 | CP A | | W 70 | S 70 | May 75 | 36 | 61 |
| 01280 | CP 2 | | W 70-1 | S 71 | May 75 | 83 | 97 (1) |
| 01280 | CP 8 | | S 70 W 71 | S 71 | Oct 75 | 33 | 86 |
| 01885 | CP 1 | | W 70-1 | 71 | June 75 | 35 | 69 |
| | CP 3 | | W 72 | S 73 | June 76 | 56 | 53 (2) |
| 02405 | | Blk A | W 71 | S 72 | Nov 76 | 36 | 58 |
| 02445 | CP 4 | CC 2 | W 72-3 | S 72-3 | May 76 | 18 | 53 |

* The percentage of the total number of plots that contain at least one acceptable seedling.

FIGURE 1.

INCREASE IN STOCKING DISTRIBUTION WITH TIME SINCE TREATMENT

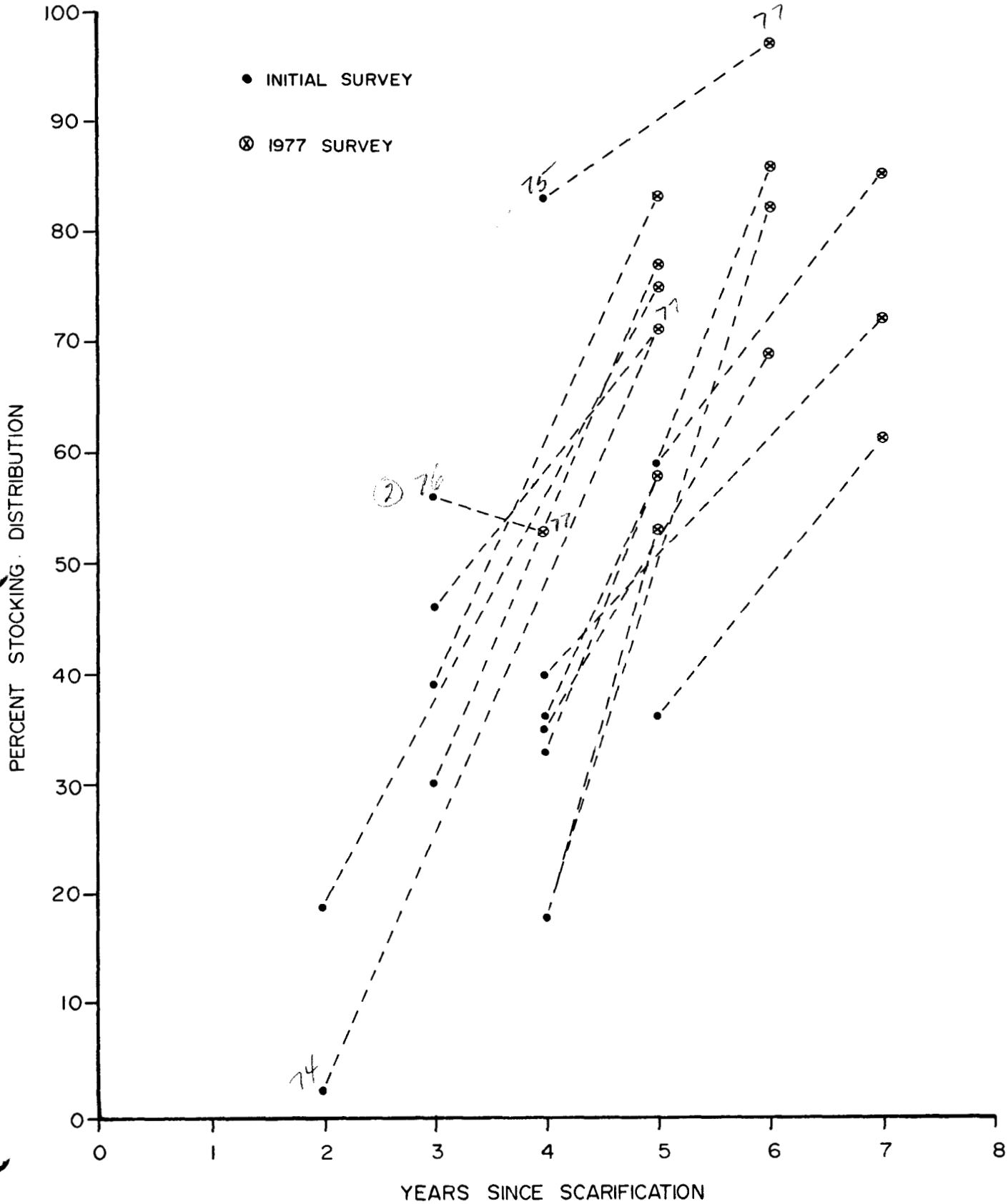

Figure 1 illustrates graphically the change in percent distribution since the time of scarification using the data contained in TABLE 1.

Almost without exception, the percent stocking increases with time since logging - the longer the period between regeneration surveys, the greater the difference between regeneration survey results i.e. the percent distribution increases with time. The only exception is 01885 CP 3 which remained virtually unchanged over the one year period 1976 to 1977.

The results of the regeneration surveys completed during the summmer and fall of 1977 in terms of stems per hectare are summarized in TABLE 2.

TABLE 2

RESULTS OF 1977 REGENERATION SURVEYS

| Stems per Hectare | % of Units Surveyed | No. of Units Surveyed | Average age of Regeneration |
|---|---|---|---|
| Less than 1000 | 7 | 5 | 3.2 |
| 1000 - 2000 | 13 | 10 | 3.2 |
| 2000 - 4000 | 31 | 23 | 4 |
| 4000 - 6000 | 21 | 15 | 4.6 |
| 6000 - 10000 | 18 | 13 | 5 |
| 10000+ | 10 | 7 | 5.2 |
| TOTAL | 100 | 73 | |

If 1000 - 2000 stems per hectare is considered as satisfactory, only 7% of the areas could be classified as N.S.R. (not satisfactorily regenerated) while 80% are overstocked. At least half of these overstocked stands will definitely need some sort of future stocking density control to maximize optimum merchantable volume increment. This proportion may very well increase with time, as TABLE 2 also indicates that stocking will increase with age (years since scarification). This supports the conclusions of Crossley (1976) and Johnstone (1976) relating to the ingress of lodgepole pine after harvesting and scarification near Hinton in Alberta.

## DISCUSSION

The operational regeneration surveys listed in TABLE 1 were done an average of 3.6 years after scarification and indicated an average stocking distribution of 36% (range 2-83%). The 1977 survey on the same areas, done an average of 5.6 years after scarification, indicate an average stocking distribution of 73%. Obviously the stocking distribution - time curve is extremely steep (Fig. 1) between these two time intervals. Any estimate of the ultimate stocking distribution would be unreliable if based upon

regeneration data obtained within five years of drag scarification. When a pre-scarification survey indicates that seed is in satisfactory supply and thereafter, an appropriate drag treatment occurs, the regeneration survey should be delayed until at least the fifth growing season after treatment. Regeneration surveys at an earlier date would be warranted if either the seed supply were limited or the quality of drag scarification was borderline.

Successful natural regeneration requires an adequate seed supply in contact with a favourable seedbed. Approximately half of the sites examined supported an overabundance of regeneration (+4000 s.p.h.) if optimum production of merchantable volume is desired. Stocking density can be controlled by the manipulation of the seed source and by the control of seedbed quantity and distribution.

If drag scarification were delayed after logging, a large percentage of the available seed would disseminate and germinate on unfavourable seedbeds during the first growing season. Many of these would succumb, and the regeneration potential of the site sould be effectively reduced. If excessive, the remaining germinants could be largely destroyed by the drag scarification treatment in the following year.

Another method whereby stocking density may be controlled is by ensuring that only a limited portion of the site is disturbed during scarification. This may be accomplished by dragging attachments with limited scarification capabilities (i.e. sharkfin drum) or by scarifying alternate strips and thereby preparing only 50% of the available area.

Before either of these methods are applied, the supervisor must be confident that the quantity of seed (cones) on the area will lead to over-stocking if normal chain drag scarification is carried out immediately after logging. This knowledge can only be obtained from a prescarification survey as described in the Reforestation Manual and Drag Scarification Handbook, 1978.

## RECOMMENDATIONS

These recommendations are based on limited data from one biogeoclimatic zone in the Prince George Forest District and could be subject to change as established research plots yield more information.

1. The method of drag-scarification (weight and type of attachments) should be matched to the site. The primary site factors which influence this selection are the number of cones, the duff depth and the slash rating.

2. On areas with an overabundant seed source, stocking could be controlled by delaying drag-scarification up to one season after logging or by the appropriate selection and configuration of drag attachments and subsequent scarifying technique. Scarification delay can only be practised on those sites where the slash does not require immediate treatment to abate the fire hazard.

3. In the Prince George Forest District regeneration surveys should be delayed until the fifth growing season after scarification, subsequent to the constraints of seed supply and adequate drag scarification treatment.

After this time a better indication of the eventual stocking distribution would be apparent. Evidence indicates that only a very small percentage of the lodgepole pine sites would be N.S.R. after this period.

4. The present regeneration survey system should be re-designed to provide information on stocking levels as well as stocking distribution.

5. A standard form which contains all pertinent logging, scarification and regeneration data is essential. This could be a separate form or included as a section of one of the forms presently used to record other site data. These data should then be available, with maps, either in the ranger district or the district office.

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