INTRODUCTION
Uneven-aged drybelt interior Douglas-fir (Pseudotsuga menziesii var. glauca) stands have been harvested for over 50 years in British Columbia. Within the Cariboo Forest Region, most drybelt Douglas-fir stands are located in the Interior Douglas-fir (IDF) biogeoclimatic zone. Stands have been partially cut at varying intensities. Natural shelterwoods, based on cutting all trees over a fixed diameter, were common through the 1970’s to the mid-1980’s. This was replaced by the single tree selection silvicultural system to improve the quality of the residual stand, decrease logging damage and improve regeneration establishment on dry sites after harvest.

Despite the number of years in which drybelt uneven-aged Douglas-fir stands have been harvested, very little information is available on post-harvest natural regeneration success and stand basal area growth rates.

In 1995, a retrospective study was initiated to increase understanding of how past harvesting practices have affected natural regeneration establishment and growth within uneven-aged Douglas-fir stands. Stands were selected in three subzones: IDFdk3, IDFxm and IDFxw. All 31 stands in the study were partially cut between 1980 and 1987, but not spaced. This extension note summarizes the results from two unpublished reports (Catton 1997; Day 1996). For clarification, the authors define Stocking as a measure of site occupancy and is described by basal area, and Density as a measure of spacing, or competition and is described by stems/ha.

STUDY OBJECTIVES
The study objectives were to:
1. evaluate natural regeneration success in partially cut uneven-aged Douglas-fir stands,
2. determine if the stands met density criteria specified in the Correlated Guidelines for Management of Uneven-aged Drybelt Douglas-fir stands in British Columbia - First Approximation (B.C. Min. of For. 1992),
3. determine post harvest basal area growth (m$^2$/ha/10yrs) and
4. determine if uneven-aged stand structure was maintained with harvesting.

RESULTS AND DISCUSSION
The main results of this study are presented in Table 1. Natural regeneration was abundant within all the sample blocks. Of the 31 blocks, 28 met
CONCLUSIONS

- there is sufficient natural regeneration regardless of harvesting intensity with one exception - steep, southerly slopes with low crown closure.
- juvenile spacing is required to improve growth and maintain density control
- basal area growth needs to accumulate on larger size trees therefore prescriptions have to leave adequate numbers of larger trees on the block by adjusting residual growing stock (B), maximum diameter (D) and quotients of dimunition (q).
- IDF Douglas-fir stands are highly variable in terms of pre-harvest stand structure - therefore prescriptions need to be site specific and carefully applied.

RESEARCH NEEDS

- development of a basal area growth model to help determine cutting cycle length and level of basal area removal. In the short term, a growth model could be created using 10 year increment data, while in the long-term the establishment and/or continued monitoring of permanent growth and yield sample plots is essential.
- determine if regeneration growth can be improved by manipulating stem density in Layer 3, and varying gap size through harvesting to improve exposure to sunlight.
- examine the relationship between stocking and density in Layers 2 - 4 and the degree of bark beetle attack in Layer 1.

REFERENCES


Catton, B. 1997. Natural regeneration in managed uneven-aged drybelt Douglas-fir stands in the IDFdk3 and IDFxm biogeoclimatic subzones - Cariboo Forest Region, Unpubl. On file with Research Section, Cariboo Forest Region


TABLE 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>IDFdk3</th>
<th>IDFxm</th>
<th>IDFxw</th>
</tr>
</thead>
<tbody>
<tr>
<td># of blocks</td>
<td>14</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Pre-harvest basal area (mean - m²/ha)</td>
<td>31.4</td>
<td>27.9</td>
<td>19.0</td>
</tr>
<tr>
<td>Post-harvest basal area (mean - m²/ha)</td>
<td>16.6</td>
<td>12.6</td>
<td>10.5</td>
</tr>
<tr>
<td>Percentage of basal area removed (range - m²/ha)</td>
<td>14-75</td>
<td>17-89</td>
<td>13-75</td>
</tr>
<tr>
<td>Post-harvest basal area growth (mean - m²/ha/10yrs)</td>
<td>5.0</td>
<td>3.5</td>
<td>3.7</td>
</tr>
<tr>
<td>Post-harvest basal area growth (range - m²/ha/10yrs)</td>
<td>2.7-8.3</td>
<td>1.9-6.2</td>
<td>1.7-7.2</td>
</tr>
<tr>
<td>Number of SR blocks (well spaced stocking standards)</td>
<td>14</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Well spaced stems/ha (mean)</td>
<td>1089</td>
<td>853</td>
<td>947</td>
</tr>
<tr>
<td>Stems/ha - Layer 3 (mean)</td>
<td>2003</td>
<td>1170</td>
<td>2047</td>
</tr>
<tr>
<td>Stems/ha - Layers 3 &amp; 4 (mean)</td>
<td>5852</td>
<td>4469</td>
<td>4840</td>
</tr>
<tr>
<td>Leader growth - Layer 3</td>
<td>11.0 ±</td>
<td>15.4 ±</td>
<td>6.1 ±</td>
</tr>
<tr>
<td>Fir (mean &amp; SD - cm/yr)</td>
<td>5.3</td>
<td>10.8</td>
<td>7.0</td>
</tr>
<tr>
<td>Leader growth - Layer 4</td>
<td>3.8 ±</td>
<td>3.7 ±</td>
<td>2.7 ±</td>
</tr>
<tr>
<td>Fir (mean &amp; SD - cm/yr)</td>
<td>2.0</td>
<td>2.7</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Table 1. Summary of Stocking, density and growth in 3 IDF subzones