PERIODIC ANNUAL GROWTH OF THE UPLAND TYPES ON THE CLOQUET FOREST

J. H. Allison

What annual growth in 20-70 year old jack pine and other post-logging forest types may one expect on fire-protected sites in northeastern Minnesota? The reinventory in 1949 of 400 quarter acre plots located within the upland forest types at the Cloquet Research Center may provide a reasonably good answer to this question.

Omega loamy sands cover 90% and Munger sandy loams 10% of the 1573 acres of forest. Both soils are of glacial outwash origin. The forest on these sites, except for the 23 acres listed as "pine plantations" (white and Scotch), is of natural origin. The jack pine came in following severe fires occurring in 1874, 1885, 1894, 1910 and 1917. The aspen and aspen-birch came in following logging in 1910 or fire in 1894. The plantations were established from 1913 to 1917, inclusive. The 121 year old red pine stands (they are not all of the same age) came in following severe fires in or prior to 1820. The other stands were established naturally following the 1910 logging of the merchantable red and white pine on these lands.

This study does not include any forest lands recently clear cut, lightly wooded or non-wooded brush lands or any other non-wooded or very lightly wooded areas. Only such lands as are actually forested have been included. No effort was made to limit the stands used to "representative" ones.

The net periodic annual growth per acre during the fourth decade following the 1910 logging of the then merchantable red and white pine is shown by type and more important species in Table I. Management, except to the extent that it successfully prevented forest fires, is not responsible for these growth rates. This is a study of extensively managed forest types. Most of these stands are understocked, more so in number of stems and basal area for trees over 4 inches in diameter breast high than in cord volume. More intensive management, in the form of thinnings, should increase the volume and ultimately the quality of the net periodic annual growth for the 186 acres in "Red Pine B", "Mixed Pines" and "Pine Plantations". Such treatment might also increase net growth for the 289 acres in "Jack Pine C" but probably would not increase the net growth rates for the other types listed.

In order to give the reader a better understanding of what these growth rates mean, they have been converted into money values (Table II). The stumpage prices used are listed below the table. They represent the approximate average stumpage prices recently received by the State for stumpage in St. Louis County.

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### TABLE I. PERIODIC ANNUAL GROWTH IN CORDS PER ACRE (1939-1949)

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Age (Yrs.)</th>
<th>Area (Acres)</th>
<th>Stand Basal Area Per Acre (Sq. Ft.)</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jack Pine</td>
</tr>
<tr>
<td>Jack Pine A</td>
<td>55-75</td>
<td>197</td>
<td>105</td>
<td>.09</td>
</tr>
<tr>
<td>Jack Pine B</td>
<td>55-75</td>
<td>231</td>
<td>103</td>
<td>.44</td>
</tr>
<tr>
<td>Jack Pine C</td>
<td>25-45</td>
<td>289</td>
<td>70</td>
<td>.68</td>
</tr>
<tr>
<td>Jack Pine Type</td>
<td>25-75</td>
<td>717</td>
<td>90</td>
<td>.45</td>
</tr>
<tr>
<td>Red Pine A</td>
<td>121+</td>
<td>61</td>
<td>97</td>
<td>.16</td>
</tr>
<tr>
<td>Red Pine B</td>
<td>21-40</td>
<td>48</td>
<td>75</td>
<td>.27</td>
</tr>
<tr>
<td>Mixed Pines</td>
<td>31-70</td>
<td>115</td>
<td>78</td>
<td>.23</td>
</tr>
<tr>
<td>Pine Plant.</td>
<td>31-40</td>
<td>23</td>
<td>93</td>
<td>.40</td>
</tr>
<tr>
<td>Conif.-Hds.</td>
<td>31-60</td>
<td>70</td>
<td>67</td>
<td>.19</td>
</tr>
<tr>
<td>Aspen</td>
<td>21-60</td>
<td>312</td>
<td>54</td>
<td>.02</td>
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<tr>
<td>Aspen-Birch</td>
<td>31-70</td>
<td>164</td>
<td>48</td>
<td>.04</td>
</tr>
<tr>
<td>Upland Balsam</td>
<td>21-70</td>
<td>63</td>
<td>64</td>
<td>.01</td>
</tr>
</tbody>
</table>

Average 75.5 .33 .14 .07 .16 .04 .74

1/ Does not include the Scenic Forest of 39 acres, 121+ years of age. This almost pure red pine stand with a total per acre volume of 59 cords of which 56 cords is red pine is growing at the rate of 0.91 cords per acre of which 0.70 cords is red pine. This stand has a total basal area per acre of 129 sq. ft. of which about 120 sq. ft. is red pine.

2/ 0.22 cords of this is white pine, planted in 1913; 0.19 cords is on Riga Scotch pine, planted in 1916 and 1917.

3/ All of this is balsam.

### TABLE II. Conversion of Table I into Money Values Based upon Average Stumpage Prices Received by the State for Stumpage Sold in St. Louis County During 1954-1956 1/

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Age Class</th>
<th>Area (Acres)</th>
<th>% of Total Area</th>
<th>Average Annual Increase in Value Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jack Pine</td>
</tr>
<tr>
<td>Jack Pine A</td>
<td>55-75</td>
<td>197</td>
<td>12.5</td>
<td>$0.22</td>
</tr>
<tr>
<td>Jack Pine B</td>
<td>45-55</td>
<td>231</td>
<td>14.7</td>
<td>1.05</td>
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<tr>
<td>Jack Pine C</td>
<td>25-45</td>
<td>289</td>
<td>18.4</td>
<td>1.63</td>
</tr>
<tr>
<td>Jack Pine Type</td>
<td>25-75</td>
<td>717</td>
<td>45.6</td>
<td>1.05</td>
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<tr>
<td>Red Pine A</td>
<td>121+</td>
<td>61</td>
<td>3.9</td>
<td>0.39</td>
</tr>
<tr>
<td>Red Pine B</td>
<td>21-40</td>
<td>48</td>
<td>3.0</td>
<td>0.65</td>
</tr>
<tr>
<td>Mixed Pines</td>
<td>31-70</td>
<td>115</td>
<td>7.3</td>
<td>0.57</td>
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<tr>
<td>Pine Plant.</td>
<td>31-40</td>
<td>23</td>
<td>1.5</td>
<td>0.96</td>
</tr>
<tr>
<td>Conif.-Hds.</td>
<td>31-60</td>
<td>70</td>
<td>4.5</td>
<td>0.45</td>
</tr>
<tr>
<td>Aspen-Birch</td>
<td>31-70</td>
<td>476</td>
<td>30.2</td>
<td>0.07</td>
</tr>
<tr>
<td>Upland Balsam</td>
<td>21-70</td>
<td>63</td>
<td>4.0</td>
<td>--</td>
</tr>
</tbody>
</table>

Weighted Average 100.0 0.77 0.55 0.31 1.63 2/

1/ Average prices per cord reported to be $2.67 for jack pine; $6.36 for old growth red pine; $3.18 for younger red pine; $1.42 for aspen-birch; and $2.00 for balsam.

2/ Includes balsam. Elsewhere balsam is an insignificant item.