REGIONAL REGENERATION PERFORMANCE ASSESSMENT
1987 SAMPLING PROGRAM

-Preliminary Report-
November 10, 1987

Submitted for Review by L. Herring

Review by:

W.C. Williams
C.S. DeLong
J.D. Sherb
1 INTRODUCTION

Field sampling commenced during mid June and concluded in late October. A two-person contract sampling crew completed 50 plantation samples during this period, approximately one half of the volume anticipated during spring planning. A computer listing of the samples is included in the Appendix. A separate report covering details of sampling performance, efficiency and areas requiring improvement is under preparation by J. Sherb. This preliminary report summarizes the progress of sampling by District, subzone and other classification variables, as well performance trends based on the present dataset. It will also describe deficiencies in the database and recommend additional sampling where it is required.

2 SAMPLE DISTRIBUTION

Table 1 and 2 indicate the distribution of samples by classification variable. As indicated in Table 1, 46% of the

Table 1. Tabulation of samples by District, subzone and species.

<table>
<thead>
<tr>
<th>Subzone</th>
<th>Species</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>5</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Spruce</td>
<td>9</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Pine</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>E1</td>
<td>Spruce</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Pine</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>E2</td>
<td>Spruce</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Pine</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td>14</td>
<td>23</td>
<td>3</td>
<td>10</td>
<td>0</td>
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</tbody>
</table>
Table 2. Tabulation of plantation ages by subzone and species

<table>
<thead>
<tr>
<th>Subzone/Species</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1S</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J1P</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1S</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1P</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2S</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2P</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

sampling conducted in 1987 was carried out in the Prince George East District. Prince George West and Fort St. James were sampled at approximately half that intensity. Due to earlier slow progress and a late start, sampling in the Vanderhoof District was terminated after only three samples. Preliminary ecological stratification was carried out in the McBride District under the supervision of C. DeLong, but RPA sampling was not initiated in this or any other District.

The intensity of sampling by biogeoclimatic subzone and plantation species provides a better picture of the status of the current database. Table 1 indicates that spruce plantations in the SBSjl subzone have been well sampled, accounting for 52% of all samples to date. All other species and subzone combinations have insufficient samples, although sampling has been initiated in each one. Spruce in the SBSel subzone is particularly sample sparse, reflecting the inadequate time spent in the Vanderhoof District.

Table 2. indicates the distribution of sample plantation age classes in the current database. Significant gaps exist in all but the SBSjl spruce cell. These gaps may be eliminated by prudent age class selection during subsequent sampling years. Insufficient samples in the 5-10 and 14-16 year age classes should also be addressed in the SBSjl spruce cell.
3 DATA ACQUISITION

After preliminary opening-file research on candidate plantations and subsequent site stratification, the contract sampler began plantation sampling. Data was collected using a 352 k byte Husky Hunter field computer and a software data acquisition program developed for the Silviculture Section. Each plantation data record contains plantation administration and site information, as well as observations and measurements for each 50 tree sample. The capacity of the computer will permit up to 25 plantation samples to be stored at one time, but the contractor was required to upload data to a desktop PC at Regional Headquarters approximately once each week for data security reasons. Datasets were stored on 5.25 inch floppy disk media, and data was backed-up by off-site storage of duplicate disks.

After initial training by the contractor on the use of the Hunter and software, data acquisition proceeded efficiently, and data image quality was consistently high.

The contractor was checked on several occasions by Regional Silviculture and Research staff, and the overall quality of the contractor's work was determined to be excellent.

4 DATA ANALYSIS

At the completion of field sampling in late October, the Regional RPA dataset consisted of 530 k bytes of ASCII files. Infrequent corrections (as indicated by the contractor on a paper printout of each plantation record) were made employing the MØF&L text editor WYLBUR-PC on an IBM-AT compatible microcomputer at Regional headquarters. The edited dataset (filename 'RPADATA.EDT') exceeds the capacity of floppy disks, so is partitioned into 4 District files ('RPADATA.PGE', 'RPADATA.PGW', 'RPADATA.VNF' and 'RPADATA.FSJ'). These datasets are stored in a database at Regional headquarters in the Research Section. Copies are available to Districts and Branch on request. All datasets are backed-up offsite for security.

A SAS-PC data input program was developed to read crop tree data records in the edited dataset. It is radically different from that illustrated in Land Management Report 35 (developed for mainframe applications) and substantially shorter. It makes extensive use of arrays for the correct labelling of node and internode contributions of each plantation sample, and makes more efficient use of desktop micro equipment. Any PC which can support SAS-PC may employ the input program and any subsequent analysis procedure. The program is illustrated in the appendix. Processing of the entire dataset required approximately 8 minutes of CPU time at 8 mhz. A second data input program has been developed to read competition data records (not provided in this report).
Each plantation sample in the dataset contains the following classification and measurement variables:

**Plantation Data Classifiers**

1. Location
2. Plot Reference
3. Region
4. District
5. Opening
6. Subzone
7. Association
8. Elevation
9. Aspect
10. Slope
11. Slope Position
12. Soil Texture
13. Soil Depth
14. Humus Form
15. Humus Depth
16. Site Preparation Method
17. Degree of Disturbance
18. Year of Disturbance
19. Plantation Species
20. Planting Date (yr-mo)

21. Stock Type
22. Stock Size
23. Stock Age
24. Seedlot
25. Nursery

**Crop Tree Data Variables**

1. Total Height
2. Nodal Heights (6)
3. Internodal Distances (6)
4. Basal Diameter
5. Breast Height Diameter
6. Foliage Condition
7. Leader Condition
8. Stem Condition
9. Damage Cause
10. Crown Radius

**Competitor Data Variables**

1. Competitor Species (several)
2. Total Height (by species)
3. Cover (by species)
4. Average Distance from Crop (by species)
5. Plot Cover(compet.tot.)
6. Plot Profile (comp. ht.)

The dataset contains all variables specified in Land Management Report #35, as well as additional ones considered important by the Region.

An initial analysis of the crop tree data has now been completed. Preliminary data sorts have been limited to Subzone and Species. Height/age and Height Increment/age plots based on these sorts are presented in the following figures (10). Plots of mean, maximum and minimum plantation height/ age are provided where the data sample size warrants it (not provided for el plantations). Similarly, height increment plots are only provided for j1 and e2 plantations.
Additional sorts may be made based on any of the 25 classification variables. However, the present dataset contains too few samples to warrant detailed analysis. Available history record information also limits the use of many of the classifiers.

5 PLANTATION GROWTH TRENDS

Distinct species growth performance differences are clearly evident in the height/age diagrams for each subzone. Site indices at any age up to 20 are twice as great for lodgepole pine as for interior spruce in j1 and e1 subzones. This species advantage is somewhat lower in the e2 subzone. Sample size limitations in the e1 prevent full subzone comparisons, but no differences in spruce growth is evident between j1 and e2 subzones. Similar small samples in lodgepole pine limit comparisons, but j1 performance appears slightly better than either e1 or e2.

6 FURTHER DEVELOPMENT

Analysis of competition data will proceed as time permits. A full report will be available prior to the next RO silviculture meeting. Subject to the report by J. Sherb, it is recommended that further sampling be planned for 1988. The following are suggestions for improvement of the database and interpretations:

6.1 Defining User's Needs

Recommendations by Regional and District Silviculture staff are required to determine the reporting format. The attached plots are first approximations, and can be changed to include the comparative information included in Land Management Report #35. Alternatively, other variables may be plotted (i.e. confidence interval of the mean, standard error bars, sample size etc.)

6.2 Defining Further Sampling Needs

Recommendations for additional sampling must be made at the earliest possible time. In addition to extending sampling to other Districts, correction of age class gaps and low sample size in existing classification cells must be considered. Also, a more detailed evaluation of existing samples should be made to ensure representation of results. For instance, of the 17 j1 spruce plantations sampled in FD 2, 14 were planted following prescribed broadcast burning. If a more representative estimate of performance is desired, further sampling of unburned plantations may be required.
6.3 Determining Changes to the Sampling Program

Based on the volume of samples projected for 1988 and the production rate of the 1987 program, changes in the scale or administration of sampling may be warranted. It may be prudent to develop individual District programs and smaller contracts to maximize efficiency. The data collection system has performed well during 1987, and it is highly recommended that it be employed in any program revision. Greater use of field data entry techniques developed in 1987 are feasible and desireable. Data management methods may be changed if desired. Districts may wish to maintain their own datasets if this is feasible. Modem links to Region may permit a greater role by Districts, without the loss of a headquarters responsibility for the Regional database.
<table>
<thead>
<tr>
<th>OBS</th>
<th>LOCATION</th>
<th>OPENING</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tomas Lk. off Cunningham rd.</td>
<td>093k010d002</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Angly Lk. on Sutherland FR</td>
<td>093k002g001</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Upper Sutherland on Angly Ck. Rd.</td>
<td>093k007b502</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>km 942 Cunningham Rd. at Ogston Lk.</td>
<td>093k010c015</td>
<td>15</td>
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</table>

<table>
<thead>
<tr>
<th>OBS</th>
<th>LOCATION</th>
<th>OPENING</th>
<th>AGE</th>
</tr>
</thead>
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<tr>
<td>5</td>
<td>Tomas Lk. off Cunningham Rd.</td>
<td>093k010d002</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>12 km Dog Ck. Rd.</td>
<td>093k008d510</td>
<td>13</td>
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<table>
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<th>OPENING</th>
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<td>7</td>
<td>km 24 Teardrop Rd. Henning Lk.</td>
<td>093j005e0006</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>km 30 Salmon FR</td>
<td>093j007d002</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Stone-Buck Rd.</td>
<td>093g068 2</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>Stone Ck. FR up from Camp Lk.</td>
<td>093g068 4</td>
<td>12</td>
</tr>
<tr>
<td>11</td>
<td>Willowy Ck. off Cripple Rd.</td>
<td>093k016a001</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
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<th>OBS</th>
<th>LOCATION</th>
<th>OPENING</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>SW Kalder Lk. on Rainbow FR</td>
<td>093k016g001</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>km 24 Teardrop Rd. Henning Lk.</td>
<td>093j005e0006</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>End of Carrier Rd.</td>
<td>093j013c0004</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>km 30 Salmon FR</td>
<td>093j007d002</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>km 34 Salmon FR</td>
<td>093j007d006</td>
<td>11</td>
</tr>
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<td>17</td>
<td>km 214 Caine Ck. Rd.</td>
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</tr>
<tr>
<td>18</td>
<td>Willowy Ck. off Cripple Rd.</td>
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<td>13</td>
</tr>
<tr>
<td>19</td>
<td>km 24 Teardrop Rd. Jumping Lk.</td>
<td>093j005d002</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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<th>LOCATION</th>
<th>OPENING</th>
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</tr>
</thead>
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<td>20</td>
<td>km 561 on Willow-South Rd.</td>
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<td>9</td>
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<tr>
<td>21</td>
<td>Hah Cr. S. of Beaver/Bowron Junction</td>
<td>093h072 24</td>
<td>11</td>
</tr>
<tr>
<td>22</td>
<td>West of Ispah Lk. at 155 km</td>
<td>093g070 7</td>
<td>13</td>
</tr>
<tr>
<td>23</td>
<td>West of Ispah Lk. on Willow Rd.</td>
<td>093g070 7</td>
<td>14</td>
</tr>
<tr>
<td>24</td>
<td>purden north rd</td>
<td>093g100 32</td>
<td>15</td>
</tr>
<tr>
<td>OBS</td>
<td>LOCATION</td>
<td>OPENING</td>
<td>AGE</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------</td>
<td>-----------</td>
<td>-----</td>
</tr>
<tr>
<td>25</td>
<td>Pitoney Lk.</td>
<td>093g070 13</td>
<td>7</td>
</tr>
<tr>
<td>26</td>
<td>km 848 Jerry Ck. Rd.</td>
<td>093g060 40</td>
<td>8</td>
</tr>
<tr>
<td>27</td>
<td>West of Jerry Ck. Bridge on 500 Rd.</td>
<td>093g060 57</td>
<td>9</td>
</tr>
<tr>
<td>28</td>
<td>km 848 Jerry Ck. Rd.</td>
<td>093g060 40</td>
<td>9</td>
</tr>
<tr>
<td>29</td>
<td>km 513 on Hodda FR</td>
<td>093j015b01</td>
<td>9</td>
</tr>
<tr>
<td>30</td>
<td>Past Jerry Ck. Bridge at 846 km</td>
<td>093g060 36</td>
<td>10</td>
</tr>
<tr>
<td>31</td>
<td>Hah Ck. S of Beaver/Bowron Junction</td>
<td>093h072 24</td>
<td>11</td>
</tr>
<tr>
<td>32</td>
<td>approx 850 km on Jerry Ck. Rd.</td>
<td>093g060 8</td>
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<tr>
<td>33</td>
<td>km 954 Bill's Ck. FR</td>
<td>093j009e007</td>
<td>11</td>
</tr>
<tr>
<td>34</td>
<td>km. 17.5 Vama Rd.</td>
<td>093g100 24</td>
<td>12</td>
</tr>
<tr>
<td>35</td>
<td>km 864 on Jerry Ck. Rd.</td>
<td>093g060 53</td>
<td>12</td>
</tr>
<tr>
<td>36</td>
<td>km 846 Jerry Ck. Rd.</td>
<td>093g060 18</td>
<td>12</td>
</tr>
<tr>
<td>37</td>
<td>km 846 Jerry Ck. Rd.</td>
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<td>12</td>
</tr>
<tr>
<td>38</td>
<td>Mcleod Lk. garbage dump off hwy</td>
<td>093j015e502</td>
<td>12</td>
</tr>
<tr>
<td>39</td>
<td>km 954 Bill's Ck. FR</td>
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<td>40</td>
<td>km 958 Bill's Ck. FR</td>
<td>093j009f012</td>
<td>12</td>
</tr>
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<td>41</td>
<td>km 968 Bill's Ck. FR</td>
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<td>42</td>
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<tr>
<td>43</td>
<td>Purden North Rd.</td>
<td>093g100 32</td>
<td>15</td>
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<td>44</td>
<td>km 966 Bill's Ck. FR</td>
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<td>45</td>
<td>Tzitzik Lk. km 151.5 on Willow</td>
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<td>46</td>
<td>300 Rd. Wansa Creek</td>
<td>093g090 15</td>
<td>17</td>
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<td>47</td>
<td>Wansa Ck. off 300 Rd.</td>
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<td>17</td>
</tr>
<tr>
<td>48</td>
<td>Vama Rd. at Hwy 16 East</td>
<td>093g090 24</td>
<td>18</td>
</tr>
<tr>
<td>49</td>
<td>hwy 16 east</td>
<td>093g090 24</td>
<td>18</td>
</tr>
<tr>
<td>50</td>
<td>hwy 16 east</td>
<td>093g090 24</td>
<td>18</td>
</tr>
</tbody>
</table>
LIBNAME RPA '\LESSAS\RPA';
DATA RPA.MEANS;    /* Identifies the output dataset*/
INFILE '\DATA\RPADATA.EDT';    /* Indicates the input dataset*/
/ *Keep statement defines the variables in the output*/
KEEP LOCATION PLOTREF REG DST OPENING ECOZON2 ASSCN ELEV
ASP SLOPE POS SOILTEX DEPTH HFORM HDEPTH SITEPR1
DISTURB1 SP1YEAR SP1MONTH SITEPRP2 DISTURB2 SP2YEAR SP2MONTH
SITEPRP3 DISTURB3 SP3YEAR SP3MONTH SPECIES PLANTYR PLANTMO
STOCKYP STOCKYZ STOCKAGE SEEDLOT NURSERY
AGE NODEAGE MHEIGHT STDHGHT MINCRMT MEANDBH MEANDBIA;
INPUT SIEVE $ 1 @;    /* Eliminates comments in record headers*/
IF SIEVE='*' THEN RETURN;
/ *Column input for all variables in input dataset*/
INPUT SAMPYR 22-23 SAMPMTH 24-25 SAMPDAY 26-27 PLOTREF $ 28-32 REG 30
DST 39-40 LOCATION $ 41-79 / OPENING $ 1-12 ECOZON2 $ 13-18
ASSCN 21-23 ELEV 27-30 ASP 31-33 SLOPE 34-36 POS $ 37-38
SOILTEX $ 39-41 DEPTH 42-43 HFORM 44 HDEPTH 45-46 /
SITEPRP1 $ 1-2 DISTURB1 $ 3 SP1YEAR 4-5 SP1MONTH 6-7 SITEPRP2 $ 8-9
DISTURB2 $ 10 SP2YEAR 11-12 SP2MONTH 13-14 SITEPRP3 $ 15-16
DISTURB3 $ 17 SP3YEAR 18-19 SP3MONTH 20-21 / SPECIES $ 1
PLANTYR 8-9 PLANTMO 10-11 STOCKYP $ 12-14 STOCKYZ 15-17
STOCKAGE 18 / SEEDLOT 1-5 NURSERY $ 6-8 / /
/ *Identifies all plantations and assigns correct age*/
IF PLANTMO=08 OR PLANTMO=09 OR PLANTMO=10 THEN AGE=SAMPYR - PLANTYR;
ELSE AGE=(SAMPYR - PLANTYR)+1;
COUNTER=0;
DBHTOT=0;
BDIATOT=0;    /*zeros all do loop variables*/
ARRAY TNODE(20);
ARRAY MNODE(20);
ARRAY TINCR(20);
ARRAY MINCR(20);
ARRAY XA(20);
ARRAY STD(20);
ARRAY CV(20);
DO I=1 TO 20;
    TNODE(I)=0;
    MNODE(I)=0;
    TINCR(I)=0;
    MINCR(I)=0;
    XA(I)=0;
    STD(I)=0;
    CV(I)=0;
END;
DO WHILE (SIEVE NE '*');
    INPUT TYPE 80 @;
    IF TYPE=1 THEN DO;    /*Identifies all crop tree record lines*/
        COUNTER=COUNTER+1;
        INPUT SUBPLOT 6-8 NODE1 9-11 NODE2 12-14 NODE3 15-17
        NODE4 18-20 NODES 21-23 NODE6 24-26 NODE7 27-29
        BASEDIA 30-33 BRSTDIA 34-37 FOLCEN $ 38-39
        LEADCN $ 40-41 STEMCON $ 42-43 DAMAGE $ 44-45
        CRWNRAD 46-48;
DDIATOT=BDIATOT+BDSTDIA;  /*Accumulates variable totals*/
BDIATOT=BDIATOT+BASEDIA;
ARRAY NODA(7) NODE1-NODE7;  /*Node array element assignment*/
  IF AGE<=7 THEN NN=AGE;
  ELSE NN=7;  /*Limits array do loop*/
/*Do loop for accumulation node elements and sums of squares*/
DO J=1 TO NN;
   TNODE(20-(AGE-J))=TNODE(20-(AGE-J))+NODA(J);
   XA(20-(AGE-J))=XA(20-(AGE-J))+(NODA(J)*NODA(J));
END;
END;
IF TYPE NE 1 THEN INPUT;  /*Ends do loop at record end*/
MEANDBH=DBHTOT/COUNTER;  /*Averages and assigns dia. var.* /
MEANBDIA=BDIATOT/COUNTER;
INPUT SIEVE $ 1 @;
END;
/*Do loop for accumulating internodal increments*/
DO J=1 TO NN-1;
   TINCR(20-(AGE-J))=TNODE(20-(AGE-J))-TNODE(20-(AGE-J)+1);
END;
DO J=1 TO 20;
   IF TNODE(J) NE 0 THEN DO;
      MNODE(J)=TNODE(J)/COUNTER;
      MINCR(J)=TINCR(J)/COUNTER;
      XB=TNODE(J)*TNODE(J)/COUNTER;  /*Assigns array elements*/
      STD(J)=SORT((XA(J)-XB)/COUNTER-1);  /*to variables*/
      CV(J)=STD(J)/MNODE(J);
      MHEIGHT=MNODE(J);
      STDHGHT=STD(J);
      CVHGHT=CV(J);
      NODEAGE=21-J;
      IF MINCR(J)=0 THEN MINCRMT=.;
      ELSE MINCRMT=MINCR(J);
      OUTPUT;
   END;
END;
RUN;

/*Sorts dataset by primary classification variables*/
PROC SORT DATA=RPA.MEANS;
   BY SPECIES ECOZONE NODEAGE;
OUTPUT OUT=RPA.MSORT1;
   /*Calculates RPA means by common nodes*/
PROC SUMMARY DATA=RPA.MSORT1 PRINT MAXDEC=0;
   CLASS NODEAGE;
   VAR MHEIGHT MINCRMT;
   BY SPECIES ECOZONE;
OUTPUT OUT=RPA.AVERAGES N= SAMPLES MEAN=MHEIGHT MINCRMT STD=STDHT
   STDERR=STDERR STDINC STDERRC STDERRHC MIN=MINHT
   MININC MAX=MAXHT MAXINC;
RUN;
PLANTATION HEIGHT/AGE DIAGRAM
FOR LODGEPOLE PINE
SBSj1 SUBZONE

LEGEND

- Mean
+ Maximum
■ Minimum
PLANTATION HEIGHT/AGE DIAGRAM
FOR LODGEPOLE PINE
SBS\text{e}2 SUBZONE

LEGEND

- Mean
- Maximum
- Minimum

HEIGHT (cm)

GROWING SEASONS SINCE OUTPLANTING

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
PLANTATION INCREMENT/AGE DIAGRAM
FOR LODGEPOLE PINE
SBSJ1 SUBZONE
PLANTATION INCREMENT/AGE DIAGRAM
FOR INTERIOR SPRUCE
SBSj1 SUBZONE
PLANTATION INCREMENT/AGE DIAGRAM
FOR INTERIOR SPRUCE
SBSe2 SUBZONE