Building a Better Douglas-fir

by Chal Landgren

Recently, some new Douglas-fir trees were grafted into the PNWCTA orchard in Lebanon. They were selected from the top 10 percent of the trees in a recent test. These five new families also represented the culmination of years of effort from many individuals and the promise of some great new seed sources for growers.

Graftings are done to greatly hasten cone and thus seed production which occurs on some trees in about five years. Cone and seed production normally take 20 to 30 years to develop in the wild.

Grafts also allow nurserymen to greatly multiply seed production by "copying" the better trees onto multiple plants. Seed harvesters like the process because it saves them from having to climb as high as 80 feet to collect cones in much older trees.

Let’s turn the clock back to 1994 in order to see how we arrived with these new trees.

Douglas-fir growers have for many years noted good provenance collection areas in BC, such as Vancouver Island and Powell River among others. In the early 1990s a plan was developed to collect seed from specific trees within provenances of interest: Vancouver Island, Texada Island and around Powell River. Collections were made as far south as 46°50' and north to 49°54' and east to west from 123°42' to 125°11'. Elevations ranged from near sea level to around 1,200 feet. The time line for this effort follows.

Besides trying to locate great candidates for the seed orchard grafting and production, we hoped to investigate two other items. The first of these was the idea that later bud breaking families may have some resistance to pest problems such as needle midge and Swiss needle cast.

The second question involved seeing how the trees performed following harvest as needle drop has emerged as a key consumer concern.

Procedures and Results
Six progeny test plots were all evaluated in 2002 (table 1). Each test site was on a grower property and managed along with other Douglas-fir. At each site 48 families were planted in five tree row plots replicated four times in each site. The table below summarizes results from the top six sources from six plots.

Some notes on each of the columns represent:

**Family #** - A number assigned to each family when collected.

**Location/Source** - With the exception of the Val 3 cross, the general collection area is listed. The Val 3 family is a cross of two excellent, well known Oregon sources, both in the PNWCTA seed orchard.

**Value** - Tree measurement teams assigned a grade and height to each tree in each plot. The value listed is an average of all trees in all plots and was computed after assigning a grade and assumed value/foot for each tree.

**Bud break** - Trees were evaluated in 2000 and 2001. These values are an average over two years. In essence, the higher the value the earlier the bud break timing. For example, a

<table>
<thead>
<tr>
<th>Family #</th>
<th>Location/Source</th>
<th>Value</th>
<th>Bud break</th>
<th>Color</th>
<th>Moisture Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3</td>
<td>Val 3 X (05)</td>
<td>$11.80</td>
<td>3.8</td>
<td>3.7</td>
<td>110</td>
</tr>
<tr>
<td>138</td>
<td>Gillies Bay (Texada Isl.)</td>
<td>$11.30</td>
<td>2.9</td>
<td>4.5</td>
<td>100</td>
</tr>
<tr>
<td>133</td>
<td>Cooks Bay (Texada Isl.)</td>
<td>$11.10</td>
<td>2.2</td>
<td>4.5</td>
<td>90</td>
</tr>
<tr>
<td>136</td>
<td>Shelter Bay (Texada Isl.)</td>
<td>$10.90</td>
<td>2.2</td>
<td>4.6</td>
<td>130</td>
</tr>
<tr>
<td>137</td>
<td>Gillies Bay (Texada Isl.)</td>
<td>$10.60</td>
<td>2.2</td>
<td>4.8</td>
<td>60</td>
</tr>
<tr>
<td>135</td>
<td>Cooks Bay (Texada Isl.)</td>
<td>$10.40</td>
<td>2.2</td>
<td>4.9</td>
<td>150</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>$11.80-$6.50</td>
<td>1.5-4.4</td>
<td>3.6-4.9</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 – Six Progeny test plots evaluated in 2002
three would represent two inches of new foliage growth on May 15, a two represents one inch of growth on the same date.

**Color**—The higher the number the darker the tree color.

**Moisture Content**—For each family ten trees were cut. Five trees were displayed in dry conditions and five in water stands for 34 days. The listed numbers are rough moisture content levels after 34 days of wet display. The more moisture in the tree, the longer it appears fresh. These tests were conducted by Gary Chastagner, WSU.

There are a number of important observations with regard to each of the top families and the traits we measured. Let’s briefly look at each of these:

**Val 3 X 053**—This family was the top rated source for value. This family was also a top performer in the trials in BC. This is encouraging as this source is prominent in the existing seed orchard. The tree tends to be light in color but is a very vigorous grower with good bud density. The family tends to be a little early in bud break timing yet was seldom damaged by spring frost on our plots.

**Family 138**—This family is not quite as rapid in growth as Val 3, yet it is the tree that catches your eye in a field. Nice dark color, upright branch habit, late bud break and bottle brush needle form.

**Family 133 and 136**—Similar to family 138, but with (continued on page 14)
even a later average bud break. These Texada Island families tend to have a unique needle form – rather short and bottle brush-like all around the stem.

**Family 137** – This family had the lowest moisture content of the trees, yet a good performer in other important areas.

**Family 135** – This family had the highest moisture content in needles after 34 days of display, also the darkest color of the lot – almost blue green.

**Other Observations and Conclusions**

We entered these trials wondering if we could establish a connection between bud break timing and disease/insect damages. Our initial thought was that there may be some relationship between midge and needle cast damage, especially with families breaking bud early. By the end of the trial no clear picture emerged.

Bud break timing did influence tree grade. A number of families broke bud early enough to be damaged by spring frosts in multiple years. These families are not listed and fared rather poorly overall.

It was also evident at the conclusion of the trial, that the southwest side of Texada Island in BC is home to some new, interesting and top performing families.

The tree grafting was completed in April 2003. Roughly 100 spaces in the PNWCTA seed orchard are made up now of these new families. In another year or so we will graft the best trees from a trial planted in 1999. Seed production will need to wait a few years, yet some great new trees are getting a start.

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**About the author:** Chal Landgren is the Oregon State University Extension Christmas tree program leader.

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