**Soil pH:**
Balsam Fir (5.0 - 6.0)  
Fraser Fir (5.3 - 5.8)

<table>
<thead>
<tr>
<th>Nitrogen</th>
<th>Optimum Range</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avail. Phosphate (ppm P)</td>
<td>4.5 - 6.5</td>
<td>6</td>
</tr>
<tr>
<td>Potash (ppm K)</td>
<td>75 - 125</td>
<td>100</td>
</tr>
<tr>
<td>Magnesium (ppm Mg)</td>
<td>35 - 60</td>
<td>&gt;35</td>
</tr>
<tr>
<td>Calcium (% Ca)</td>
<td>50 - 55%</td>
<td>50%</td>
</tr>
<tr>
<td>Aluminum (ppm Al)</td>
<td>&lt;70</td>
<td>&lt;70</td>
</tr>
</tbody>
</table>

**Nitrogen:**
Fertilizer N lb/ac = 90 to 110 lb/ac N (this equals 1.09 oz/tree N at 5’x5’ tree spacing)
To avoid salt injury and improve fall color, apply 2/3 N in spring and 1/3 N in early fall.

**Phosphorus:**
Fertilizer P₂O₅ lb/ac = (6 - soil test ppm) x 2.27 x 2
(if UVM soil test ppm<6, limit application to Max. 100 lb/ac P₂O₅, Min. 40 lb/ac P₂O₅)
Lime to raise pH will also make more P available from soil

**Potassium:**
Fertilizer K₂O lb/ac = (125 - soil test ppm) x 2.4 x 2
(If UVM soil test ppm<125, limit each application to Max. 100 lb/ac K₂O to avoid salt injury to roots.
On very sandy soils limit to 50lb/ac K₂O for each application)

**Calcium:**
Lime - Chart describes tons per acre to apply to move to desired target pH if mixed in top 6” of soil only.
Only use the full rate of Lime if plowing/harrowing into soil when establishing a new plantation.
Limit applications to established stands at one-quarter (1/4) of recommended rate in any one year.
Use Hi-Mag Lime (Dolomitic Limestone) if soil test Magnesium (ppm Mg) is <35 ppm.

<table>
<thead>
<tr>
<th>Soil test pH (water)</th>
<th>Soil test Al (ppm)</th>
<th>Lime (lb/ac) to apply to increase soil 0.1 pH value at different Aluminum levels in soil</th>
<th>Soil test pH (typical examples)</th>
<th>Lime (lb/ac) (1/4 rate) to apply for target pH 5.5 (sample calculations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5.5</td>
<td>0-40</td>
<td>500</td>
<td>4.2</td>
<td>500 x 13 x .25 = 1625 lb/ac</td>
</tr>
<tr>
<td></td>
<td>41-70</td>
<td>500</td>
<td>4.2</td>
<td>667 x 13 x .25 = 2167 lb/ac</td>
</tr>
<tr>
<td></td>
<td>71-100</td>
<td>667</td>
<td>4.4</td>
<td>667 x 11 x .25 = 1834 lb/ac</td>
</tr>
<tr>
<td></td>
<td>101-150</td>
<td>667</td>
<td>4.7</td>
<td>667 x 8 x .25 = 1334 lb/ac</td>
</tr>
<tr>
<td></td>
<td>151-200</td>
<td>667</td>
<td>5.5</td>
<td>667 x 0 x .25 = 0 lb/ac</td>
</tr>
<tr>
<td></td>
<td>&gt;200</td>
<td>667</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Samples to:**
University of Vermont
Agricultural & Environmental Testing Laboratory  
Jeffords Hall, Room 262  
Burlington, VT 05405-1737

**Contact for more information:**
Jeff Carter  
UVM Extension Agronomy  
23 Pond Lane, Suite 300  
Middlebury, VT 05753  
(802) 388-4969 x 332  
Email: jeff.carter@uvm.edu

Rev 10/11
**Recommended Foliar Sampling and Analysis for Christmas Trees in Vermont**

- General status of tree nutrient content for fertilizer recommendations in established plantings.
- Specific Micro-nutrient imbalances to monitor corrective treatments in established plantings.

1. Sample in late October when trees have gone dormant for the winter.
2. Select and tag 10 to 15 trees which are average for all trees in field to be tested.
3. Sample only current growth from the top one-third (1/3) of each tree.
4. Break two or three branches 6” long from each tree. Place in a paper bag.
5. Remove all needles from the stems (fresh or after drying).
6. Fresh needles must be sent the same day to testing lab. You can also dry needles in a warm spot (up to 150° in the oven) before sending to lab.
7. Label the sample using lab form with name, address, type of tree, what test to run. A standard test includes N,P,K, Ca,Mg,Al,B,Cu,Fe,Mn,Zn (Maine or Vermont).
8. Send to analytical lab with payment.

### Foliar Analysis - Optimum Test Values and Ratios for Balsam Fir & Fraser Fir Christmas Trees

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Minimum</th>
<th>Optimum</th>
<th>Your Test</th>
<th>Optimum Ratio</th>
<th>Your Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>N - Nitrogen</td>
<td>1.8</td>
<td>2.0</td>
<td>%</td>
<td>1:1</td>
<td></td>
</tr>
<tr>
<td>P - Phosphorus</td>
<td>0.20</td>
<td>0.25</td>
<td>%</td>
<td>&gt; 0.10:1</td>
<td></td>
</tr>
<tr>
<td>K - Potassium</td>
<td>0.60</td>
<td>0.75</td>
<td>%</td>
<td>&gt; 0.35:1</td>
<td></td>
</tr>
<tr>
<td>Ca - Calcium</td>
<td>0.60</td>
<td>0.80</td>
<td>%</td>
<td>&gt; 0.35:1</td>
<td></td>
</tr>
<tr>
<td>Mg - Magnesium</td>
<td>0.10</td>
<td>0.15</td>
<td>%</td>
<td>&gt; 0.06:1</td>
<td></td>
</tr>
<tr>
<td>Mn - Manganese</td>
<td>200</td>
<td>500</td>
<td>ppm</td>
<td>0.025:1</td>
<td></td>
</tr>
<tr>
<td>Fe - Iron</td>
<td>70</td>
<td>80</td>
<td>ppm</td>
<td>0.004:1</td>
<td></td>
</tr>
<tr>
<td>B - Boron</td>
<td>25</td>
<td>35</td>
<td>ppm</td>
<td>0.002:1</td>
<td></td>
</tr>
<tr>
<td>Zn - Zinc</td>
<td>20</td>
<td>60</td>
<td>ppm</td>
<td>0.003:1</td>
<td></td>
</tr>
<tr>
<td>Cu - Copper</td>
<td>4.5</td>
<td>5.5</td>
<td>ppm</td>
<td>0.0003:1</td>
<td></td>
</tr>
<tr>
<td>Mo - Molybdenium</td>
<td>0.10</td>
<td>0.85</td>
<td>ppm</td>
<td>0.00004:1</td>
<td></td>
</tr>
<tr>
<td>S - Sulfur</td>
<td>1620</td>
<td>0.09:1</td>
<td>ppm</td>
<td>0.09:1</td>
<td></td>
</tr>
<tr>
<td>Cl - Chlorine</td>
<td>5.5</td>
<td>0.0003:1</td>
<td>ppm</td>
<td>0.00003:1</td>
<td></td>
</tr>
<tr>
<td>Na - Sodium</td>
<td>0.45</td>
<td>0.0003:1</td>
<td>ppm</td>
<td>0.00003:1</td>
<td></td>
</tr>
</tbody>
</table>

**References:**

**Prepared by:** Jeff Carter, UVM Extension Agronomy Specialist. Middlebury, VT

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