Woody ornamental plants are key components of a well-designed landscape. Landscape plantings divide and define areas, add aesthetic qualities and increase a property’s environmental and economic value.

There are many woody plants available for use in landscaping, so select carefully. Choose plants based on their ability to fulfill your purposes and grow well in your property’s environment.

Install landscape plantings according to a plan, keeping two factors in mind:

• Use the right plants in each area to create your desired design effect.
• Place plants in the right environment, with proper sun exposure, soil pH, drainage and water.

Trees and shrubs last for many years. Giving them proper growing conditions and care will ensure that they remain a healthy and aesthetically pleasing part of your landscape. Table 1 lists trees and shrubs that do well in Alaska.

**Planting trees and shrubs**

You can purchase trees and shrubs in a variety of ways (Figure 1):

- *Bare-root* (BR) plants have little or no soil around the roots. This method is common for deciduous plants and small evergreens.
- Balled and burlapped (B&B) plants are dug with soil. The root ball is enclosed with burlap or a synthetic material.

---

**Table 1**

<table>
<thead>
<tr>
<th>Tree or Shrub</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Picea sitchensis</em></td>
<td>*( sitka spruce)</td>
</tr>
<tr>
<td><em>Picea glauca</em></td>
<td>*( black spruce)</td>
</tr>
<tr>
<td><em>Abies grandis</em></td>
<td>*( douglas fir)</td>
</tr>
<tr>
<td><em>Tsuga heterophylla</em></td>
<td>*( western hemlock)</td>
</tr>
<tr>
<td><em>Pinus contorta</em></td>
<td>*( lodgepole pine)</td>
</tr>
<tr>
<td><em>Quercus alba</em></td>
<td>*( white oak)</td>
</tr>
<tr>
<td><em>Cornus alternifolia</em></td>
<td>*( dogwood)</td>
</tr>
<tr>
<td><em>Amelanchier alnifolia</em></td>
<td>*( serviceberry)</td>
</tr>
</tbody>
</table>

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By Ray Maleike, Extension Horticulture Specialist, Washington State University.

Adapted by Julie Riley, Extension Faculty, Agriculture and Horticulture, Cooperative Extension Service, University of Alaska Fairbanks.
The following zone designations are based on lowest winter temperature. In most situations, a plant will grow in the hardiness zones warmer than its designation if other factors, such as precipitation, don’t cause problems.

### Zone 2—Interior Alaska, coldest parts of Southcentral Alaska
### Zone 3—Much of Southcentral Alaska and parts of Interior, Southeast and Kodiak
### Zone 4—Warmest parts of Southcentral, much of Southeast and Kodiak
### Zone 5—Parts of Southeast and Kodiak

#### Deciduous Trees

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>Species/Variety</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amur chokecherry</td>
<td><em>Prunus maackii</em></td>
<td>2</td>
</tr>
<tr>
<td>Birch</td>
<td><em>Betula papyrifera</em></td>
<td>2</td>
</tr>
<tr>
<td>Birch, weeping</td>
<td><em>Betula pendula gracilis</em></td>
<td>2</td>
</tr>
<tr>
<td>Canada red cherry</td>
<td><em>Prunus virginiana</em></td>
<td>2</td>
</tr>
<tr>
<td>Crabapple</td>
<td><em>Malus baccata</em>, <em>Malus cultivars</em></td>
<td>3</td>
</tr>
<tr>
<td>Green ash</td>
<td><em>Fraxinus pennsylvaniana</em></td>
<td>4</td>
</tr>
<tr>
<td>Hawthorn</td>
<td><em>Crataegus laevigata</em></td>
<td>4–5</td>
</tr>
<tr>
<td>Japanese tree lilac</td>
<td><em>Syringa reticulata</em></td>
<td>3</td>
</tr>
<tr>
<td>Linden, basswood</td>
<td><em>Tilia cordata</em>, <em>T. americana</em></td>
<td>4</td>
</tr>
<tr>
<td>Maple, Amur</td>
<td><em>Acer ginnala ssp. ginnala</em></td>
<td>3</td>
</tr>
<tr>
<td>Maple, Norway</td>
<td><em>Acer platanoides</em></td>
<td>4</td>
</tr>
<tr>
<td>Maple, Tatarian</td>
<td><em>Acer tartaricum</em></td>
<td>3</td>
</tr>
<tr>
<td>Maple, vine</td>
<td><em>Acer circinatum</em></td>
<td>4</td>
</tr>
<tr>
<td><em>Mayday tree</em></td>
<td><em>Prunus padus</em></td>
<td>2</td>
</tr>
<tr>
<td>European bird cherry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain ash</td>
<td><em>Sorbus aucuparia</em>, <em>S. decora</em>, <em>S. sitchensis</em></td>
<td>2</td>
</tr>
<tr>
<td>Tamarack, larch</td>
<td><em>Larix decidua</em>, <em>L. sibirica</em> (L. russica)</td>
<td>2</td>
</tr>
<tr>
<td>Ussurian pear</td>
<td><em>Pyrus ussuriensis</em></td>
<td>3</td>
</tr>
</tbody>
</table>

* Mayday tree has become invasive in the Anchorage and Fairbanks areas. It has escaped cultivation and spread into natural areas.

#### Evergreen Trees

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>Species/Variety</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska cedar</td>
<td><em>Chamaecyparis nootkatensis</em></td>
<td>4–5</td>
</tr>
<tr>
<td>Fir, subalpine</td>
<td><em>Abies lasiocarpa</em></td>
<td>2</td>
</tr>
<tr>
<td>Fir, white</td>
<td><em>Abies concolor</em></td>
<td>3</td>
</tr>
<tr>
<td>Pine, Austrian</td>
<td><em>Pinus nigra</em></td>
<td>3</td>
</tr>
<tr>
<td>Pine, bristlecone</td>
<td><em>Pinus aristata</em></td>
<td>3</td>
</tr>
<tr>
<td>Pine, limber</td>
<td><em>Pinus flexis</em></td>
<td>3</td>
</tr>
<tr>
<td>Pine, lodgepole</td>
<td><em>Pinus contorta</em> ssp. <em>latifolia</em></td>
<td>3</td>
</tr>
<tr>
<td>Pine, Scotch, Scots pine</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Pine, Swiss stone</td>
<td><em>Pinus cembra</em></td>
<td>3–4</td>
</tr>
<tr>
<td>Spruce, Black Hills</td>
<td><em>Picea glauca</em> ‘Black Hills’</td>
<td>2</td>
</tr>
<tr>
<td>Spruce, Colorado</td>
<td><em>Picea pungens</em></td>
<td>3</td>
</tr>
<tr>
<td>Spruce, Norway</td>
<td><em>Picea abies</em></td>
<td>3</td>
</tr>
<tr>
<td>Spruce, white</td>
<td><em>Picea glauca</em></td>
<td>2</td>
</tr>
</tbody>
</table>

* Siberian pea has become invasive in parts of Southcentral Alaska.

#### Deciduous Shrubs

<table>
<thead>
<tr>
<th>Shrubs</th>
<th>Species/Variety</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine currant</td>
<td><em>Ribes alpinum</em></td>
<td>2</td>
</tr>
<tr>
<td>American cranberry</td>
<td><em>Viburnum trilobum</em></td>
<td>2</td>
</tr>
<tr>
<td>Bush viburnum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amur maple</td>
<td><em>Acer ginnala</em></td>
<td>3</td>
</tr>
<tr>
<td>Cotoneaster</td>
<td><em>Contoneaster actufolius</em>, <em>C. lucidus</em></td>
<td>3</td>
</tr>
<tr>
<td>Eastern ninebark</td>
<td><em>Physocarpus opulifolia</em></td>
<td>3</td>
</tr>
<tr>
<td>False spirea</td>
<td><em>Sorbaria sorbifolia</em></td>
<td>2</td>
</tr>
<tr>
<td>Flowering raspberry</td>
<td><em>Rubus odoratus</em></td>
<td>4</td>
</tr>
<tr>
<td>Forsythia</td>
<td><em>Forsythia ovata</em> ‘Northern Girl,’ ‘Northern Gold,’ ‘Northern Sun’</td>
<td>3</td>
</tr>
<tr>
<td>Gooseberry</td>
<td><em>Ribes hybrids</em></td>
<td>2–3</td>
</tr>
<tr>
<td>Honeysuckle</td>
<td><em>Lonicera tatarica</em>, <em>L. caerulea</em></td>
<td>3</td>
</tr>
<tr>
<td>Japanese spirea</td>
<td><em>Spiraea japonica</em> ‘Anthony Waterer,’ ‘Gold Flame,’ ‘Little Princess’</td>
<td>3</td>
</tr>
<tr>
<td>Lilac, Canadian</td>
<td><em>Syringa x prestoniae</em></td>
<td>2</td>
</tr>
<tr>
<td>Lilac, common</td>
<td><em>Syringa vulgaris</em></td>
<td>3</td>
</tr>
<tr>
<td>Lilac, dwarf Korean</td>
<td><em>Syringa meyeri</em>, <em>S. patula</em> ‘Miss Kim’</td>
<td>3</td>
</tr>
<tr>
<td>Nanking cherry</td>
<td><em>Prunus tomentosa</em></td>
<td>3</td>
</tr>
<tr>
<td>Potentilla, cinquefoil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red-leaf rose</td>
<td><em>Potentilla fruticosa</em></td>
<td>2</td>
</tr>
<tr>
<td>Red-twig dogwood</td>
<td><em>Rosa glauca</em></td>
<td>2</td>
</tr>
<tr>
<td>Rhododendron</td>
<td><em>Cornus sericea</em></td>
<td>3</td>
</tr>
<tr>
<td>Rose tree of China</td>
<td><em>Mollis hybrid azaleas, ‘Northern Lights’ series</em></td>
<td>4</td>
</tr>
<tr>
<td>Rugosa rose</td>
<td><em>Prunus triloba</em></td>
<td>3</td>
</tr>
<tr>
<td>Serviceberry</td>
<td><em>Rosa rugosa</em></td>
<td>2</td>
</tr>
<tr>
<td>*Siberian pea shrub</td>
<td><em>Caragana arborescens</em></td>
<td>2</td>
</tr>
</tbody>
</table>

* Siberian pea has become invasive in parts of Southcentral Alaska.
• **Container** plants are grown and sold in containers.
• **Field-potted** plants are grown in a field and dug with or without soil. They then are potted into containers filled with organic media, field soil or a combination of the two.

**Planting**

Proper planting procedures are crucial to establishing a healthy plant. Planting procedures depend on which type of plant you choose (e.g., bare-root, balled and burlapped, etc.). Instructions for the common types are given below.

**Bare-root**
1. Cut back damaged roots, making a clean cut. Then soak the roots in water for 1 to 2 hours.
2. Dig a hole wider, but not deeper, than the root system.
3. Put the plant in the hole to the level where it was growing in the nursery (Figure 2). You can put a cone of soil under the plant for support. Spread the roots.
4. Backfill with native, *not amended*, soil. If you wish, mix a slow-release fertilizer with the backfill soil. Tamp down the soil to remove air pockets.
5. Water thoroughly.

**Balled and burlapped**
1. Dig a hole wider, but not deeper, than the root ball (Figure 3).
2. Remove the burlap or synthetic material around the ball, along with all rope, string or twine tying materials.
3. Clean-cut all damaged roots.
4. Place the ball in the planting hole with the top of the ball even with the soil surface.
5. Backfill with native, *not amended*, soil. If you wish, mix a slow-release fertilizer with the backfill soil. Tamp down the soil to remove air pockets.
Container plants

1. Dig a hole larger than the spread-out root system.
2. *Remove the container*, no matter what kind, even papier-mâche and peat pots.
3. Prepare the roots. Some tree-care specialists recommend washing all soil from roots so that they can be more carefully inspected.
   a. If roots are not circling (pot-bound), carefully spread the exterior roots away from the soil mass.
   b. If roots are circling, make six to eight vertical slashes in the root ball and spread the roots out. If the roots are very woody and circling, lay the ball on its side and use a spade or shovel to slice all the way through the bottom half of the root ball. Also slash the top half of the root system with six to eight vertical cuts. Spread the two flaps out.
4. Place the prepared root ball in the planting hole with the surface of the container media level with the soil surface.
5. Backfill with native, *not amended*, soil. If you wish, mix a slow-release fertilizer with the backfill soil. Tamp down the soil to remove air pockets.

Pruning

Contrary to popular opinion, it is not a good idea to prune one-fourth to one-third of a tree or shrub’s branches when you plant it. However, light pruning may be helpful. Follow these steps:
1. Remove dead or injured branches.
2. Remove interfering, rubbing or crossed branches.
3. Remove one branch from narrow “V” crotches (multiple, or co-dominant, leaders). Leave the other branch to become the leader.

Staking

A plant that is supported by a stake from the time it is small grows differently than an unstaked plant. It may be taller and thinner and have deformed xylem and less root growth. It may not be able to stand by itself.

If staking is not needed, don’t do it. If you do need to stake a plant in a windy area, follow these steps (Figure 4):
1. Drive two stakes into firm ground about 6 inches away from the trunk. The line formed by the two stakes and the tree trunk should be perpendicular (at a right angle) to the prevailing wind.
2. Tie the two stakes to the trunk as low as possible. Use a material that will not chafe or damage the bark.
3. Remove stakes as soon as possible after the roots are established and the plant is stabilized, typically after one growing season.

Fertilizing

Do not put fertilizers, except slow-release types and phosphorus, into planting holes. Roots that come into contact with fertilizer particles may be damaged (burned). After planting, you can apply 1 to 3 ounces (3 to 9 tablespoons) of nitrogen fertilizer to the soil surface around each plant. Scatter the fertilizer over a 3-foot by 3-foot area (9 square feet).
Watering

A recently transplanted plant needs special attention through its first growing summer. The nursery soil around a potted or B&B plant may be radically different from the soil where it is planted, and water may not move readily between the two. Therefore, it is important to apply water to both the nursery soil and the surrounding soil during the establishment period. Roots grow only where there is moisture; unless both media are moist, roots may never grow out of the original nursery soil.

Container soils, in particular, have a bad habit of drying out much faster than the surrounding soil or backfill soil. Moisten both media adequately to prevent new plants from being injured or dying of drought. However, be careful not to over-water.

Mulching newly established shrubs and trees helps prevent moisture loss. Apply no more than 2 to 3 inches of mulch.

Preparation

If time allows, root prune the plant a year or more before digging it. The fall before you plan to move the plant, divide the circumference of the root area into six segments and prune every other segment by driving a sharp spade into the ground to the full length of its blade. (Make the circle of cuts slightly smaller than the size of the ball you’ll eventually dig.) New roots will grow at the cut edges. The following spring, prune the remaining segments. When you dig the plant for transplanting, make the root ball larger than the root-pruned area to retain the maximum number of new roots.

Moving the plant

It is best to ball and burlap both deciduous and evergreen plants before moving them to minimize damage. Dig a trench around the plant, just beyond the spread of its branches (or just beyond your root-pruning cuts). Cut through woody roots, but leave fibrous roots intact if possible. Use a fork to loosen the soil around the outer edge of the root ball to reduce its size and weight.

Next, cut under the ball and tip it to the side so you can work a sheet of plastic or burlap under it. Tip the ball from side to side carefully to prevent excessive damage. Wrap the ball tightly with plastic or burlap, lift the plant from the hole and move it to its new location. Unwrap the ball and plant it as you would a B&B plant.

Transplanting established plants

Careful selection and placement of a plant should make transplanting unnecessary. Occasionally, however, you may need to move a plant. Plants often die after transplanting because of root damage or poor handling. Generally, the younger the plant and the more careful you are, the better your chance of success.

Timing

The best time to move evergreens is early to mid-autumn. Move deciduous plants while they are dormant (usually from late fall to early spring, anytime the ground is not frozen).
Fertilizing

Woody ornamental plants require moderate soil fertility to thrive. High soil fertility stimulates excessive and possibly undesirable growth. Low fertility is likely to make plants grow poorly and lack vigor. Plants stressed by low fertility are more susceptible to insect pests, diseases and other problems, such as lack of hardiness.

If plants are growing well in fertile, well-drained soil, they may not require regular fertilization. Fertilizers can be expensive, and many are manufactured using non-renewable fossil fuels. If leaching and erosion occur, they can enter water supplies. Thus, remember these important tips:

• Fertilize woody plants only when needed.
• Apply the correct amount of fertilizer at the right time of the year.
• Place fertilizers where they will be available to the plant’s roots.

Determining the need for fertilizer

Whether or not you carry out a yearly fertilizer program for landscape plants should depend on the inherent fertility of your soil, how well the plants are growing and whether you recycle nutrients (e.g., grass clippings or leaves). Very sandy soils, for example, may lack sufficient clay and organic matter to hold nutrients and may be prone to low fertility. Landscape plants growing in such soils often exhibit nutrient deficiency symptoms unless they are fertilized regularly. On the other hand, trees and shrubs in regularly fertilized turf areas may not need supplemental nutrients.

If plants are not doing well, fertilization may be helpful, but only after you determine the cause of the problem. Some possible indicators of a need for fertilization are:

• Smaller than normal leaves
• Light green or yellowish leaves (if the plant’s leaves normally are dark green)
• Shorter than normal annual shoot growth
• Dead twigs and branch tips

However, these symptoms also may be caused by environmental, insect, disease or other cultural problems. It is prudent to rule out any such causes before embarking on a fertilizer program.

Research indicates that nitrogen may be the only nutrient that improves growth of woody landscape plants. However, in Alaska, soils that have never been fertilized are typically low in phosphorus and potassium. There has been little research on fertilizing woody landscape plants in Alaska. Having your soil tested by a reputable laboratory can help you determine the levels of phosphorus and potassium. Very low readings of these two minerals may indicate the need to add these nutrients to your fertility program.

Fertilization is appropriate in some specific cases. For example, it may help newly planted trees and shrubs reach their potential. Fertilizing also benefits trees and shrubs that have been partly or completely defoliated by insects or disease, or those that are stressed by digging or trenching in their root zone. Appropriate fertilizer application also may stimulate recovery from winter injury.

Types of fertilizer

The three numbers on fertilizer packages refer to the percent of nitrogen (N), phosphorus (as phosphate, $P_2O_5$) and potassium (as potash, $K_2O$), always in that order. Many fertilizer formulations are available, but since woody plants generally respond
only to nitrogen, it is appropriate to use formulations in which nitrogen is predominant. Some examples are 22-11-11 and 22-4-4. Lawn fertilizers without weed killers are acceptable for fertilizing woody landscape plants.

**How much fertilizer to apply**

**Calculating by area**

Deciduous, broadleaf evergreen and needleleaf trees (conifers) can be fertilized each year with 2 to 6 pounds of actual nitrogen per 1,000 square feet. If your soil is very poor or plants are not growing well, consider using the higher amount. If plants are growing well and you know the soil is fairly fertile, use the lower end of the range or none at all.

For flowering trees and shrubs, particularly crabapples, use no more than 2 pounds of actual nitrogen per 1,000 square feet. Too much nitrogen may stimulate shoot growth at the expense of flowers.

Once you know how much actual nitrogen you need, it’s easy to calculate the amount of fertilizer to use. For example, to apply 3 pounds of actual nitrogen per 1,000 square feet using a 22-11-11 fertilizer, divide the desired amount of nitrogen (3 pounds per 1,000 square feet) by the percent of nitrogen in the formulation (22 percent, or 0.22). Thus:

\[ 3 \div 0.22 = 13.5 \text{ pounds} \]

Thirteen and a half pounds of 22-11-11 gives 3 pounds of nitrogen for a 1,000-square-foot area. The area beneath a tree usually is not exactly 1,000 square feet. To find the area beneath a tree or shrub, put four stakes in the ground to form a square that encloses the dripline or extends beyond it (Figure 5). Measure the distance between the two stakes along one side of the square and multiply this number by itself to get the area in square feet. Divide this number by 1,000. Then multiply the answer by the pounds of fertilizer needed per 1,000 square feet. This number is the amount of fertilizer needed for the tree.

Example: If one side of the square is 20 feet, then the area under the tree is 20 feet by 20 feet, or 400 square feet. Four hundred square feet divided by 1,000 square feet equals 0.4. If you need 3 pounds of actual nitrogen per 1,000 square feet, and you want to use a 22-11-11 fertilizer, you need 13.5 pounds of fertilizer per 1,000 square feet. Multiply 13.5 pounds times 0.4 (400 square feet) to get 5.4 pounds, or roughly 5.5 pounds of 22-11-11. This is the amount to spread under the tree. The calculations for this example are:

\[ 20 \text{ ft} \times 20 \text{ ft} = 400 \text{ sq ft} \]
\[ 400 \text{ sq ft} \div 1,000 \text{ sq ft} = 0.4 \]
\[ 3 \text{ lb N} \div 0.22 = 13.5 \text{ lb} \]
\[ 13.5 \text{ lb N} \times 0.4 = 5.4 \text{ lb fertilizer} \]

**Calculating by plant size**

You also can determine how much fertilizer to apply based on a plant’s trunk size, height or spread. For example, shade trees
Trees with a trunk diameter of less than 6 inches (measured at 36 inches above ground) should receive from \( \frac{1}{8} \) to \( \frac{1}{3} \) pound of nitrogen per inch of trunk diameter. Trees greater than 6 inches in diameter can receive \( \frac{1}{5} \) to \( \frac{2}{3} \) pound of nitrogen per inch of trunk diameter.

Flowering trees and large shrubs can receive from \( \frac{1}{8} \) to \( \frac{1}{3} \) pound of nitrogen per inch of stem diameter. Shrubs often are fertilized according to their height or spread. Use \( \frac{1}{20} \) to \( \frac{1}{10} \) pound (about 1 to 1½ ounces) of nitrogen per foot of height or spread.

Figure the amount of fertilizer to apply to an 8-inch diameter shade tree as follows. If you want to apply \( \frac{1}{3} \) pound of actual nitrogen per inch of trunk diameter, multiply the pounds of nitrogen needed (0.3) by the diameter of the trunk (8). Divide this number (2.4) by the percent nitrogen expressed as a decimal (0.22 for 22-11-11 fertilizer). Thus:

\[
\frac{\frac{1}{3} \text{ lb} \times 8 \text{ in}}{0.22} = \frac{2.4 \text{ lb actual nitrogen}}{0.22} = 10.9 \text{ lb of 22-11-11}
\]

Round off to 11 pounds.

**How to apply fertilizer**

Apply fertilizer throughout a tree or shrub’s drip zone (the area from the trunk to the edge of the canopy). You can broadcast fertilizer over the soil surface and water it in immediately. However, inorganic nitrogen applied to the soil surface may damage grass or other plants growing under the tree. It also can be used by these plants before it reaches the tree’s roots. To avoid these problems, put the fertilizer into 12- to 18-inch-deep holes, spaced every 2 feet around the dripline, and then irrigate.

**When to fertilize**

Although there is some controversy about the best time to fertilize woody plants, research indicates the most effective time for deciduous plants is in spring after growth begins. For trees or shrubs planted in turf areas, it may be better to split the amount into several applications to avoid burning the grass. Make the first application as growth begins, the second about 4 weeks later and the third, if necessary, 2 to 4 weeks after the second.

Fertilizing landscape plants with high-nitrogen fertilizer after mid-July is not recommended. It may stimulate growth that will not have time to harden off before fall; consequently, the plant may be damaged by winter freezes. Wait until plants are dormant, or fertilize as they begin growth in the spring. However, if your soil is deficient in phosphorus and/or potassium, a midsummer application of these two minerals may increase flowering and hardiness for the next season.

**Fertilizing hints**

- Never put any type of herbicide-containing fertilizer (“weed-and-feed”) into planting holes, on the soil covering plant roots or into soil near woody plants.
- Fertilizer applications do no good without moisture. If conditions are dry, irrigate soon after applying fertilizer.
- Do not apply dry fertilizer to wet turf.
- Fertilizers containing water-insoluble, organic nitrogen sources may take 3 to 8 weeks to break down to a usable form. Time applications accordingly.

**Watering**

Watering landscape plants is one of the most misunderstood tasks facing gardeners. Most homeowners are unaware of the often droughty conditions in spring in Southcentral and Interior Alaska. Water-stressed landscape plants may be more sus-
ceptible to other problems such as insects, diseases and winter injury.

A good rule of thumb for watering is to fill the entire root zone with water and then allow the soil to dry partially before watering again. How much the soil should dry out between irrigations depends on plant species and size. For large trees and shrubs, allow the top several inches of soil to dry before rewatering. Water small, newly established or extremely shallow-rooted plants before very much soil drying occurs. Become familiar with how long it takes to completely moisten the root zone of various plants in your landscape and how deeply the soil can dry before plants begin to show signs of stress.

Some situations may require more frequent watering than the rest of your landscape. Check these areas and water them more often. For example:

- Shrubs and groundcovers near house foundations, under eaves or in hot afternoon exposures may receive little water from natural precipitation or may transpire water rapidly, so they may be stressed during warm summer days.
- Mounds or berms have much more soil surface exposed to evaporation than does the natural soil profile so they dry out more quickly.
- Some plants, such as rhododendrons, azaleas and ferns, demand more moisture or have shallow roots that dry out quickly during warm, sunny weather.

Many native woody plants should not be watered during the summer once they are established. Most are drought-tolerant, and some may be damaged by summer moisture. The following genera include many drought-tolerant plants: Cotoneaster, Juniperus and Pinus.

**How to water**

Water trees and shrubs just inside and outside their dripline or outer edge. For foundation or border plantings, water the entire area.

Hoses, soaker hoses or various kinds of sprinklers are common watering methods. For deep watering trees growing in turf, try a root feeder without the fertilizer. This is a tedious process, but it gets water into areas of the root zone that may take a long time to reach with a sprinkler.

In soils that are slow to accept water, try building a dish-like or berm-enclosed area around the base of newly planted trees or shrubs. Fill this area with water. Before winter, remove the basin rims to avoid icing-up during mid-winter thaws.

**Watering container plants**

Plants in containers need special care because both the volume of soil and amount of available water in containers are limited. Water these plants more often than those in the ground. The frequency and amount of water needed depend on the media, exposure to sun or wind, temperature and type of plant. Plants growing in plastic or ceramic containers need water less often than those in porous fiber or clay pots.

Water when the media surface feels dry. If a container completely dries out, you may need to soak it to rewet the soil.

A potted plant, such as an upright juniper, or one that is pot-bound, may need to be watered daily or even several times a day during dry weather. For most container-grown plants, however, a thorough watering once or twice a week is sufficient.
Be careful not to keep the root system soaking wet. Disease problems occur more often when soil is constantly wet.

**Watering hints**
- Remember that most trees and shrubs in Southcentral and Interior Alaska need water in the spring and early summer.
- A quick, light watering does not wet the root zone properly. Frequent, shallow watering leads to shallow roots. Shallow roots suffer more stress during drought or hot weather and may freeze in very cold weather.
- You can water any time of the day.
- Too much water is as bad as, or worse than, too little. Excess water can run off, leach nutrients and promote root diseases.
- Do not apply water faster than the soil can absorb it.
- Inorganic fertilizer does absolutely no good unless it is dissolved in water. Always water after applying fertilizer if it doesn't rain.

**Woody landscape plant problems**

If cared for properly, landscape plants can live a long, healthy life. However, they can suffer damage from a wide variety of causes. Microorganisms cause problems such as root rots and foliage diseases. Insects also cause injury. However, most plant problems are due to adverse weather or cultural conditions that stress the plant. These conditions include freezing, drought, over-watering and improper use of fertilizers. Tree thinning and construction activities such as grading also contribute to stress by compacting soil and injuring plants with equipment.

Symptoms of plant damage resulting from stress sometimes do not show immediately. In fact, they may not be obvious for years. Symptoms may result from the accumulation of several stress conditions. In addition, the older a plant is, the less likely it is to successfully adapt to change or difficult conditions.

**Root problems**

The root systems of semi- to fully mature trees and shrubs normally extend far beyond the plant’s dripline. The rooting depth normally is fairly shallow — usually only to the depth of good soil. Sometimes roots grow very close to or above the soil surface. This condition may be caused by any of the following:
- A high water table
- A hard soil layer (hardpan) just beneath the surface
- Shallow, frequent watering

Several root problems are discussed below. Keep in mind that these problems may show up in other plant parts, especially leaves.

**Girdling (strangling) roots**

*Symptoms:* This problem eventually limits water and nutrient transport, causing slow deterioration of the plant. The plant is stressed, and top growth diminishes.

*Causes:* Debris such as sheetrock or lumber in the soil; twisting the plant during the planting process.

*Remedies:* Remove debris and foreign materials from the soil before planting. Chop off girdling roots and spread the roots out when planting.
**Circling roots**

*Symptoms:* General decline of plant vigor over a period of time.
*Cause:* The plant remained in its container too long at some stage of development (not necessarily the last).
*Remedy:* Spread the roots, butterfly the root ball or slash and spread.

**Kinked roots, one-sided root system**

*Symptoms:* General decline of plant vigor over a period of time.
*Causes:* Improper production methods, jamming the plant in the pot or planting hole, dragging with a mechanical planter (J-shaped roots).
*Remedy:* Cut off kinked roots and carefully spread and straighten the remaining roots when planting.

**Root rots**

*Symptoms:* Soft brown, partially to totally decayed roots. The plant usually wilts and partially or totally dies.
*Causes:* Vary depending on susceptibility of the plant to disease organisms, poor soil aeration, amended backfill soil, inadequate drainage and over-watering.
*Remedies:* Increase downward and lateral drainage. Plant nonsusceptible species or resistant varieties. Do not amend backfill when planting. Monitor watering.

**Suffocated roots**

*Symptoms:* No buttressing or flaring out of the tree or shrub’s base. Leaf and branch growth declines from the top down.
*Causes:* Fill or paving around the plant’s base decreases the air supply to roots and changes water movement patterns. So does planting too deeply. Susceptibility varies with species. Birch are extremely vulnerable.
*Remedy:* Removing excess soil is seldom successful.

**Cut roots**

*Symptoms:* Death or decline in growth from the top of the plant downward.
*Cause:* Digging trenches within the plant’s root zone.
*Remedies:* Avoid cutting large roots; tunnel under or over them where possible. Cut back damaged roots cleanly. Water the plant. Fertilization is of questionable benefit.

**Compacted soil**

*Symptoms:* A decline in growth from the top down.
*Causes:* Soil compaction or root damage from foot or machine traffic after the plant is in the ground.
*Remedies:* Buffer the area with a thick mulch. Direct traffic away from plants.

**Burlap or other materials left on the root ball**

*Symptoms:* Wilting and eventual death.
*Causes:* Not taking the plant out of its pot before planting. Not removing burlap and wire from root balls.
*Remedy:* Take the pot and other materials off the plant before planting.

**Stem problems**

Stem maladies usually arise from improper care or stress.

**Heart rot**

*Symptoms:* Decay of heartwood or other internal portions of the trunk or branches.
*Causes:* Improper pruning, broken branches, storm damage, wounded stems or root damage.
*Remedies:* Remove decayed wood, but not down to sound wood. Filling cavities is of questionable value. If decay is in advanced stages, remove the tree for safety. Avoid problems by using proper pruning techniques.
Stem wounds, cankers or girdling

*Symptoms:* Bark wounds.
*Causes:* Rope left on after planting, careless use of lawn mowers or weed trimmers, staking ties or wires left on too long.
*Remedies:* Remove all ties when planting. Stay away from plant stems and trunks with mowing and weed-cutting equipment. If damage occurs, cut away the injured bark in a rounded ellipse. Painting or spraying the wounded area provides no benefit and may even be detrimental.

Fork pockets, bark inclusions or narrow crotches that may split

*Causes:* Two or more branches compete to be the central leader (codominant leaders).
*Remedy:* Prune out all but one of the leaders if the tree is young. If the tree is old, consider cabling or bracing the competing limbs.

Bark scald, sunscald

*Symptoms:* Dead bark, usually on the south or southwest side of the trunk.
*Causes:* Hot sun, alternate freezing and thawing of bark. Newly transplanted and young, thin-barked trees such as birch and apple are very susceptible.
*Remedies:* Shade the southwest side of the trunk, paint with white latex or wrap. Wrapping is of questionable benefit on mature trees, although it may be helpful for newly planted trees. If you do wrap a trunk, use wrap that is light-colored (to reflect sunlight) and woven (to allow air passage). If damage occurs, cut loose bark back to firmly attached bark.

Graft failure

*Symptoms:* Large overgrowths appear above or below a graft union or the plant breaks cleanly at the graft union. Leaves change color early in autumn.

*Cause:* Incompatibility between the grafted scion and stock.
*Remedy:* Purchase plants rooted from cuttings (not grafted). Avoid stock-scion combinations with known problems.

Leaf problems

Symptoms of stem and root maladies may show up in leaves. Many insects and diseases also affect leaves.

Wilted leaves

If a plant is wilted, the leaves are losing water faster than it can be supplied by the roots. Plants vary in how much water they need. The exact cause of wilting must be determined by observing symptoms and the plant’s environment. Some possibilities are discussed below.

*Drought or lack of water*

*Symptoms:* Soft growth wilts. Extended periods of dryness can cause early leaf drop, marginal and interveinal chlorosis (yellowing) and necrosis (tissue death).
*Cause:* Not enough water in the soil.

*Lack of roots*

*Symptoms:* Wilting, early leaf drop, chlorosis, necrosis, poor growth, death.
*Causes:* Rot or decay (caused by poor drainage), trenching, transplanting or insects (e.g., root weevils).
*Remedies:* Determine the cause, then take appropriate action. Watering may help if the problem is not due to poor drainage.

*Flooding*

*Symptoms:* Plant is wilted or droopy.
*Cause:* Too much water limits oxygen to roots, thereby reducing or stopping respiration.
**Remedies:** Improve drainage. Decrease water supply.

**Salt damage**

**Symptoms:** Marginal to interveinal chlorosis or necrosis, rootlets brown instead of white. In containers, the soil surface or edge of the pot may be covered with white salt deposits.

**Cause:** Soil can accumulate excessive salts from fertilizers, manures and deicing materials. This problem may be more prevalent in containers than in gardens.

**Remedy:** Leach salts from soil by applying irrigation water in excess of the water-holding capacity of the soil. See Chapter 3, *Soils and Fertilizers*, for more information.

**Yellow (chlorotic) leaves**

**Nitrogen deficiency**

**Symptoms:** Overall yellowing, older leaves first.

**Cause:** Not enough available nitrogen in the soil.

**Remedy:** Fertilize with a nitrogen fertilizer.

**Other causes**

Chlorosis also may be caused by drought, misuse of herbicides (see “Herbicide damage” below), bright sunlight or natural leaf maturity. Some plants naturally have variegated or light green leaves.

**Herbicide damage**

Herbicides kill weeds, but may also damage desirable plants. Almost all herbicide damage results from misuse. Few problems arise when label directions are followed closely. The key is to read the label and think.

If many plants in one area show symptoms, suspect herbicide damage. Severity and type of damage depend on the type of herbicide, amount applied, plant species and stage of growth at the time of application.

Some herbicides, such as 2,4-D affect plant hormones, causing twisted and distorted growth. Others herbicides inhibit photosynthesis and chlorophyll production, causing chlorosis. Know where the root zones of your desirable plants are. Take special care when applying turf herbicides for broadleaf weed control within the root zones of desirable plants. Liquid formulations that are applied to leaf surfaces are likely to cause less damage to nontarget plants (as long as there is no drift) than granular products, which must be dissolved and taken up through the roots.

Dormant oil, used for insect and mite control, may damage evergreens if applied during freezing weather or if not well mixed. Dormant oil also may wash off the blue color of Colorado blue spruce (*Picea pungens*), but does not otherwise harm the plant.

**Winter injury**

**Causes**

Winter injury may be caused by a complex combination of circumstances rather than a single factor. Factors involved include:

**Weather**

- Deviation from normal minimum winter temperatures
- Dramatic fluctuations in winter temperatures
- Length of a severe cold period
- Time of year when a cold period occurs
- Bright, sunny days with frozen soil
- Depth to which the soil freezes
- Drying winds
- Low humidity
- Lack of snow cover, mulch, or other insulating materials
Site
- Distance from a large body of water
- Solid fences, hedges or barriers that trap cold air and create frost pockets
- Soil moisture availability before a freeze
- Soil conditions, soil type and mulch
- Raised beds or containers
- Windbreaks

Plant
- Genetic hardiness of the species
- Genetic adaptation to a geographic area (ecotype)
- Differences in hardiness of different plant tissues
- How well the plant is established
- Condition of the plant: dormant or partly dormant; stressed from drought, fertilizer burn or insect damage
- Growth stage of the plant
- Protective reactions of the plant, e.g., leaf drop or leaf rolling

Animals
- Moose, voles, shrews

Why winter injury happens
Winter injury to landscape plants occurs in various ways. By understanding how plants react to winter temperatures, you sometimes can predict the type and extent of damage that might occur and take actions to protect your plants.

Ultimate winter hardiness is controlled genetically and varies greatly among species and even among plants within the same species. For example, Douglas-firs (Pseudotsuga menziesii) that evolved in the Rocky Mountains are hardier than those that evolved in the Cascades. Likewise, flowering dogwoods (Cornus florida) from New York are hardier than those from Florida or Georgia, even though they are the same species. A plant’s hardiness is affected by photoperiod and its latitude of origin.

Plants native to a geographic region have evolved in response to the area’s climate and weather patterns. The hardiest plants survive and produce offspring, passing on their genetic hardiness. Thus, native plants usually survive winter cold.

Many landscape plants are introduced. They may be adapted to completely different environments than they encounter in Alaska. Cold hardiness develops each fall in an organized pattern as physiological changes take place in a plant. These changes are driven by the arrival of shorter days and cooler temperatures. The rate of acclimation varies by species and the extent of cooling. If fall temperatures remain warm, plants may fail to adequately acclimate to cold.

Deacclimation, or dehardening, is the loss of hardiness. It is a plant’s response to warming temperatures in late winter and early spring. Typically, deacclimation is gradual, but it can be rapid during an extended warm period.

Cold temperature damage may occur at any time depending on the severity of the cold and the stage of hardiness of the plant. It is most common in the following situations:
- A sudden, dramatic drop in temperature following a relatively warm fall—Plants may not yet be acclimated to cold.
- Very cold midwinter temperatures—Even after a good acclimation period, marginally hardy plants may suffer damage.
- A sudden, severe temperature drop after a warm spell in late winter or early spring—Plants may have started to deacclimate.
- A late freeze after growth starts in the spring—New, soft growth usually cannot tolerate frost. Plants that bloom or start to grow early in the season, such as forsythia, rose tree of China and some very early-
blooming rhododendrons, are susceptible to damage from late spring freezes.

**Types of winter injury**

**Bud and stem damage**

Buds and stems die or are damaged if a plant is not genetically hardy or has deaccli-

mated. Some buds or tissues may be killed, while others remain healthy. In Southeast Alaska, cold may partially or completely kill rhododendron flower buds. Thus, there may be fewer flowers than normal on these plants after a colder-than-normal winter.

**Frozen roots**

The potting media in an aboveground container may freeze, killing a plant’s roots. In some plants, stem tissue is much harder than roots, so the top of the plant may not be damaged. It may leaf out in spring and then, for no apparent reason, wither and die. Check the roots to see whether this type of injury has occurred. Dead roots usually are brown or black and may be soft. Live roots may have a white growing tip and are white to greenish when their outer tissue is scratched. You can reduce this type of damage by putting containerized plants in a protected area such as a cool garage or greenhouse during winter or trenching into your garden.

**Sun and wind damage to leaves**

During periods of severe cold combined with bright sunshine, the leaves of some broadleaf evergreens deacclimate. Then, when the sun sets, the deacclimated leaf tissue freezes. Ice forms in the cells, rupturing their membranes and walls, and the cells die.

Damage usually is worse on leaves exposed to the afternoon sun (on the south or southwest side of the plant). Plants vary in their susceptibility to sunscald.

Winter wind and sun, alone or in combination, can damage evergreens by causing them to transpire (lose water) through their leaves or needles. The water is not replaced because roots cannot take in water from cold or frozen soil. Affected leaves turn brown, starting at the edges or tips and progressing between the veins or down the needles.

Prevent these maladies by protecting plants from wind or shading them.

**Sun and wind scald to bark**

Bark can suffer sunscald on sunny winter days. It occurs when bark and cambial tissues deacclimatize and do not reacclimate quickly enough when the sun sets and the temperature drops abruptly. The result is tissue damage or death. Suncscalded bark often cracks open or separates from the tree without splitting. Damage usually occurs on a trunk’s exposed southwest side although there are differences of opinion as to whether the hot sun and a rapid decrease in temperature is the only cause. Sunscald is more prevalent on stressed, recently transplanted, smooth-barked or thin-barked trees.

To prevent sunscald, wrap trunks of recently transplanted trees and those that were stressed during the growing season. Use light-colored wrapping and wrap from the soil line to the first set of branches. Leave the material on for the first winter.

**Bark splitting and frost cankers**

Frozen bark is common on plants’ lower trunks or crowns (where the roots and stem meet). It is caused by cold temperatures near the soil surface and often is a problem where there is no protective mulch or snow cover. Stem wounds may increase the chance of damage.
After thawing, the dead bark dries, splits and separates from the wood, girdling the crown. Sometimes, instead of splitting and loosening, bark adheres to the wood and forms a sunken area or canker as it dries. In either case, the plant no longer can transport food from its leaves to its roots, resulting in death of the roots and eventually the entire plant.

In the spring, twigs and leaves on damaged trees may appear alive and green, but the plant actually is dead. Leaves even may start to grow in the spring and then wither and die for no apparent reason.

Limb and branch breakage

Branches may break because of heavy snow or ice. Some species, such as the Amur maple, are especially susceptible to this type of damage because of their weak branching structure. Prune the broken portion back to an undamaged branch or the main trunk. On large branches, make pruning cuts just outside the branch collar.

Delayed symptoms

The results of winter injury sometimes take months or years to appear. Sometimes, leaves live until their reserves are depleted, which occurs slowly in cool weather but rapidly when the weather suddenly warms.

Graft unions may be sensitive to damage from cold. Only a portion of the graft may be injured. It may function for years until another kind of stress causes it to fail.

Winter-damaged tissue may allow disease organisms and insects to enter. Again, these problems may not be evident for years.

Root systems, especially of shallow-rooted plants such as rhododendrons and blueberries, may be injured by cold. In some years, this type of injury has been noted in Southcentral Alaska on crabapples. After a damaging winter, trees leaf out unevenly. If they leaf out completely, later in the season branches may start to die.

Preventing winter injury

- Select plants adapted to your local climate and soil conditions.
- If possible, place evergreen plants in areas that minimize their exposure to sun and wind. Otherwise, provide a windbreak or shading during winter.
- In the fall, wrap the trunks of young and recently transplanted trees with a white or light-colored woven wrap.
- Keep plants healthy by proper planting, fertilizing, watering and pest control.
- Do not fertilize, prune or water heavily late in the growing season. Doing so can encourage late-season growth that may not acclimate well.
- Protect shrubs from heavy snow accumulation (Figure 6).
Water landscape plants, especially evergreens, during fall and early winter dry spells. Pay close attention to plants under overhangs or in other places where they may not receive rain or snow.

What to do for winter-injured plants

Don’t do anything until new growth begins on live wood, usually in late spring. It is easier to determine which stems actually are dead after growth begins. Sometimes, faded green branches begin to regrow and do not die. Even if leaves are dead, stems and vegetative buds still may be alive.

Before pruning a sad-looking plant to almost nothing or pulling it out altogether, check for signs of life. Scraper the bark away with a fingernail or make a shallow cut just under the bark with a pocketknife. Live branches are bright green or white just beneath the bark. Dead branches are brown and may look water soaked.

Check the plant in several places: at the twigs, farther down the branches and at the crown or soil line. If the outer twigs are dead, move toward the trunk until you find live tissue; older wood may be hardier than young wood.

Once you determine the extent of the damage, do the following:
1. Prune out and remove dead and severely damaged wood. Prune properly, leaving no stubs. Prune back to live, green, healthy wood: a bud, live stem or trunk. Do not prune live wood.
2. Water properly during the following growing season. Pay particular attention to plants beneath eaves.
3. If the soil lacks adequate amounts of basic plant nutrients, add fertilizer. If growth appears normal, fertilize only lightly, if at all.
4. Use a loose, organic mulch to maintain soil moisture and protect the upper roots from temperature extremes.
5. On damaged fruit trees, remove as much developing fruit as possible to allow the plant to recover and rebuild reserves rather than produce fruit.

In short, the best thing you can do for a winter-injured plant is to avoid further stress during the coming season by giving it special attention and care.

Construction damage

When clearing a building site, developers often leave large, well-established trees to enhance the property’s aesthetic value. Often, however, these trees soon decline. They may exhibit stunted, brown leaves, twigs or needles; thin foliage; and dead twigs and branches.

Causes

There may be a variety of causes, but damage often is the result of land-clearing and building activities.

Change of grade

When preparing a building site, developers often move soil, sometimes to level areas that once were sloping, or to slope areas that originally were level. If trees are left standing, soil may be added over their roots, or the original soil level may be lowered. These changes can cause significant damage and even death of trees.

Raising the grade can suffocate roots. The damage may depend on the kind of tree, the depth of the soil fill and the texture of the fill. Many trees — especially birch — are adversely affected if several inches of soil fill are placed over their roots. Sandy or gravelly fills are less damaging than heavier textured soils such as silt or clay.
Placing asphalt paving or concrete over a root system can have the same suffocating effect as raising the grade around a tree. These processes usually cause significant root damage.

Lowering the grade also can be detrimental. Most feeder roots, which supply the tree with water and nutrients, are located in the top 6 to 8 inches of soil. Removing soil removes or injures many of these roots. If enough large roots are lost, the tree may lack anchorage and fall. Also, damaged or broken roots sometimes rot back to and into the stem.

Grade changes also may affect the water table, either lowering or raising it in response to soil changes. Also, paved areas may direct more or less water into a tree’s root zone. The larger the tree, the more difficult it is for it to recover.

**Soil compaction**

Heavy equipment or repeated human traffic compacts soil. Compacted soil is less open to air and water movement, thus creating adverse conditions for root growth. Sandy soils or soils high in organic matter tend to compact less than heavy, clayey soils.

**Mechanical injury**

Bulldozers and other equipment may gouge the bark off a tree’s trunk or root crown, and can damage roots simply by moving over them. If bark is completely knocked off around its trunk, a tree will die. In less severe cases, decay organisms may enter wounds. Large, untreated stem wounds eventually can cause internal rot, sometimes called heart rot.

Digging trenches for foundations, pipes and cables causes serious root loss and damage. The closer the trench to a tree, the more severe its effect will be. Damaged trees may die or fall.

**Tree thinning**

Sometimes builders or homeowners remove selected trees to create space, decrease shade or give desirable trees more room. When trees are thinned, the remaining trees are exposed to more wind. They may suffer damage ranging from a few broken limbs to completely blowing over. A stand’s vulnerability increases when the larger trees are taken out or blow down.

**Preventing or lessening construction damage**

Before land clearing and construction begin, mark off the dimensions of the building, driveway and other major construction areas. Decide which trees to save (or transplant) based on their proximity to the construction area, health, age and species. Then build a barrier to keep equipment away from the remaining trees. If trenching near desirable trees is necessary, tunnel under, rather than through, the root system. If you must raise the grade around a desired tree, construct a dry well around it. Consult a reputable tree specialist for advice.

**Care after construction**

**Care for damaged trees**

Usually the owner of a new house or other structure is not involved in land-clearing and construction decisions and has no idea what changes have taken place. Often, developers and builders do not take proper precautions with regard to trees. Thus, the owner may not be aware of damage until trees begin to show signs of stress. By that time, chances of saving them may be slim.
Even with prompt treatment, severely damaged trees may die. The sooner treatment is begun, the better the chance of recovery. Water and fertilize damaged and possibly damaged trees and shrubs properly. In this case, water is much more important than fertilizer. Use a complete fertilizer containing nitrogen and phosphorus in about equal proportions. Spring is the best time for fertilizer application to damaged trees. See “Fertilizing” earlier in this chapter for more information.

If trees are wounded, remove loose and dead bark from around the wounded area and shape the wound margin with a sharp knife. If callus tissue (the ridge of tissue that forms around and eventually covers a wound) has started to form, do not cut into it. Wound dressing (wound paint) serves no useful purpose and may be detrimental.

Pruning — particularly excessive pruning — diverts carbohydrate production to a plant’s top (shoots) at the expense of root growth. Thus, pruning is not a good idea if there is root loss. Otherwise, prune dead and damaged wood back to sound wood. Use thinning cuts.

Remove dead trees. If live trees are a hazard, remove or cable them. Have professionals do all pruning and removal of large trees. There are a number of certified arborists in Alaska.

**Care for protected trees**

Even with proper land clearing and building, good tree care following construction is vital to continued life and growth of trees and large shrubs. Proper watering and fertilizing are necessary. Additional pruning may be necessary to direct future growth. Keep trees under observation for 8 to 10 years after construction and treat promptly if needed.

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**For more information**

**UAF Cooperative Extension publications**

*Landscape Plants for Alaska*, HGA-00035.


*Transplanting Trees Successfully*, HGA-00335.

**UAF School of Natural Resources and Agricultural Sciences**


**Alaska Department of Natural Resources (Division of Forestry) publications**

Available at UAF Cooperative Extension Service or on-line at forestry.alaska.gov/community/publications.htm

*Diagnosing Tree Health Problems*,

*Hiring an Arborist*,

*Mulching Trees and Shrubs in Alaska Landscapes*,

*Plant the Right Tree Near Utility Lines*,

*Protect Your Home from Wildfire*
USDA Forest Service publications


Insect and Disease Publications

Amber-marked Birch Leaf Miner
Birch Aphids
Birch Leaf Roller
Black-headed Bud Moth
Carpenter Ants
Clearwinged Birch Borer
Cottonwood Leaf Beetle
Eriophyid Mites
European Yellow Underwing
Gall and Woody Aphids on Spruce and Hemlock
Insects and Diseases of Alaskan Forests
Larch Sawfly
Large Aspen Tortrix
Poplar Leaf Miner
Spruce and Larch Bud Moths
Spruce and Giant Conifer Aphids
Spruce Bark Beetles-A Guide to Tree Management Options
Spruce Beetle in Alaska Forests
Spruce Broom Rust
Spruce Budworm
Spruce Needle Cast
Spruce Needle Rust
Wood Boring Insects
Yellowheaded Spruce Sawfly

Other USDA Forest Service publications


Other publications


**Additional references**


Landscape Plants for Alaska, http://alaska-plants.org