



Hardwoods 101: Planning, Planting, and Maintenance

Yvonne C. Barkley

High-value hardwoods - their beauty, strength, craftsmanship, and workability are unmatched. Each has its own characteristics, uses, and value. And with six different USDA climate zones, and elevations ranging from 350 to over 7,000 feet, the potential for many hardwood species to grow successfully in the Inland West is outstanding.

Whether you are planting one hardwood tree in your yard or planning to establish a plantation with hundreds of trees, there are some basic planning, planting, and maintenance activities that will benefit all hardwood trees.

Species selection.

You may be interested in planting a few trees for shade around your house or planting many trees for a particular purpose, such as a windbreak or living snowfence, for timber or nut production, or to establish a sugarbush. But before you even think about buying even one tree, you need to do some homework. Start by asking your self what you want your trees to do for you:

- o Shade your patio?
- o Have year round interest?
- o Provide food and habitat for birds?
- o Produce nuts for human consumption?
- o Produce wood?
- o Provide sap to make maple syrup?
- o Block the wind?
- o Provide privacy and block noise?

There are some species of hardwoods that are suitable for some of these things and some that are more suitable for others – but there is no one species that will be able to provide it all.

Once you have decided what you want from your trees, and this can be different things for different trees, you then need to look at the site(s) you have for planting them in and determine if you have a good match.

Location, location, location.

Choose your planting site with care. If the location you chose is unsuitable for the species you intend to plant, no amount of site preparation or care will enable your tree(s) to flourish. Hardwoods have their own sets of preferred characteristics, which vary somewhat by species and seed source. Species suited to wet sites will probably not survive on a dry, southern exposure without supplemental irrigation and dry site species may decline and even die on a wet site.

Determine your USDA hardiness zone (www.usdahardinesszone.com). It is ok to go with a species that grows in a zone colder than yours, but stay away from species that are rated for warmer zones – trust me, there will always be a cold spell that will knock out the tree you planting in that “well protected” area.

Hardwoods, as a group, thrive in a wide range of soil conditions, from swamps to the sandiest desert soils, and tolerate pH levels from 4.1 to 8.2. In general, deep, loose, well-drained soils without hardpan layers are best. Drainage is important - many hardwood species “drown” if planted on a site that has standing water for more than one to two weeks per year. Ask your local garden center or County Extension Office what the typical soil types are in your area and what the average soil pH is.

Nutrients are generally not a limiting factor in tree growth unless an extremely high or low soil pH has rendered them unavailable for plant use. Once trees reach five years of age an annual application of fertilizer formulated for hardwoods tree can be beneficial, especially in urban areas where the native topsoil has been removed from the site during construction.

East- and north-facing slopes favor more shade-tolerant, moisture-demanding hardwood species. Gentle slopes or flat ground with adequate drainage is suitable for the widest range of species. The steeper the slope, the harder you will have to work at planting and maintaining your trees. South- and west-facing slopes, areas with poor drainage or standing water, and frost-pockets (low-lying areas where cold air pools, having colder temperatures than the surrounding areas) will greatly limit species selection.

How many trees do I order?

You may just want to plant a few hardwoods in your yard. But if you are planning a larger planting you need to figure out how many trees to order. This sounds like a no brainer, but you need to take into consideration the cultural needs and the end use of the species (timber vs nut production?) you are planting and what spacing you want them to be at when they mature.

Using your site map, first decide how you want to space the trees. If you planted your trees so each one had sufficient space to grow without competing with others, you would have very few trees per acre. In their native environment, hardwoods grow in competition with many other species of plants and animals. Competition plays a vital role in determining the form of timber trees. But economically, you want to grow as many trees per acre as possible, while limiting competition for light, moisture, and nutrients. Many people prefer a 10' x 16', or a 14' x 14' spacing. This allows room between rows to do maintenance activities, and for a commercial thinning of every other tree within the rows when they reach merchantable size.

Allow additional room for aisles around the outside of the planting.

Once you've determined your spacing, you can calculate how many trees you need. Start by figuring out how many trees will fit on your site using your determined spacing. It is a good idea to order five to ten percent more seedlings than the total number of trees needed to allow for trees damaged during shipping and handling, mistakes made in calculations, and trees damaged during planting.

An easy formula to follow is:

$$\frac{\text{Sq. ft. of plantation}}{\text{Spacing of trees (sq. ft.)}} = \# \text{ of trees} + 10\% = \# \text{ trees to order}$$

Example:

$$\frac{200' \times 200'}{10' \times 16'} = \frac{40,000 \text{sq. ft.}}{160 \text{ sq.ft.}} = 250 + 10\% (25) = 275 \text{ trees}$$

Order seedlings from a nursery that knows the source of seed used to grow seedlings. Seedlings from northern seed sources and/or higher elevations than your particular site will tend to have greater frost tolerances and hardiness, desirable characteristics for hardwoods planted in the Inland Northwest.

Site Preparation.

Site preparation requirements depend on the type of vegetation presently on the site. People have different opinions about how a planting site should be prepared. Some believe clean cultivation, or an eradication of all vegetation, followed by an application of a pre-emergent herbicide, is the best way to go. Others believe minimum tillage practices, with the least amount of disturbance to the existing cover, is best. Many times the site will dictate the type of necessary preparation. A recently converted agricultural site takes less preparation for planting than a site with dense shrub and weed cover. However, agricultural lands tend to have an accumulation of annual weed seed, so follow-up control will be required. Regardless of how you choose to prepare your planting site, you will want a 3' x 3' area around your tree(s)

that is vegetation free - this allows for easy maintenance.

Weed control.

Weed control is one of the important factors determining the success or failure of your hardwood planting. Weeds grow astonishingly fast and planning how to deal with them before planting will give you a head start. A completely weed-free planting site is the best way to get a jump on this problem. After eradicating existing weeds, a pre-emergent herbicide is usually the best way to keep them from re-establishing. Pay special attention to patches of noxious weeds like thistles, as they are very hardy and difficult to control. Contact a your local Extension office or licensed pesticide distributor or consultant for specific weed control recommendations.

For those preferring not to use chemicals, persistent tilling and hoeing, landscape fabric, or mulch can keep your planting area weed-free. Landscape mats and mulch not only control weeds immediately around trees, but also have the added benefit of conserving soil moisture directly around the tree. Both organic and fabric mulches block light from reaching the ground around each tree, thereby preventing new weeds from developing. Well decomposed sawdust, straw, and bark are popular organic mulches. They are readily available, moderately priced, and easy to apply. Organic mulches biodegrade and need to be replenished with another layer every one to three years. Man-made fabric mulches are usually made of high-tech materials such as polypropylene or polyethylene, are usually treated for protection against ultraviolet degradation, and are micro-perforated to allow water and air exchange with the root zone. Fabric mulches give you all the benefits of organic mulches with less maintenance. However, fabric mulches are expensive and some types need specialized machinery to install.

Irrigation.

Will you want or need to irrigate your trees? If so, remember the distance from the nearest water source and plan accordingly. Seedlings that receive

supplemental moisture the first three to five years after establishment have been shown to have better survival and growth rates than non-irrigated seedlings, especially during drought years. Surface, sub-surface, or drip irrigation is recommended over sprinkler irrigation because they are more efficient water users than sprinklers and more economical in the long run. Sprinkler systems also moisten leaves and branches, providing ideal conditions for diseases to proliferate.

Animal Browse Protection.

Hardwood trees are extremely susceptible to animal damage. Deer, elk, moose, porcupines, mice, and rabbits eat foliage and/or bark, while pocket gophers eat roots. How do you protect your hardwood investment from these natural, but pesky, creatures? A wide variety of animal damage control methods are available, with various rates of costs and success.

But nothing will protect your hardwood plantation better than a good fence. Figure 1 (page 4) shows an ideal permanent fence, designed to exclude not only deer and elk, but rabbits and pocket gophers as well. This type of fence would be appropriate where you would want complete and continual protection from not only feeding damage, but also from deer and elk using tree trunks to rub the velvet off their antlers in late summer. A hardwood nursery or a chestnut or black walnut plantation may economically justify the investment in this type of fence. Figure 2 (page 4) illustrates a very effective temporary fence that will protect your hardwoods from deer and elk until the trees can gain enough height to put the leaders out of browse range.

Individual tree shelters are also effective protection against animal browse damage. Solid plastic shelters that can be folded around the tree work best and can be reused. For best results, position the bottom level with the ground and secure with a sturdy, weatherproof stake. Chicken wire cages, sleeves of PVC pipe, and aluminum foil wrapped around the bottom 12" of the trunk

Figure 1. Permanent electric fence.

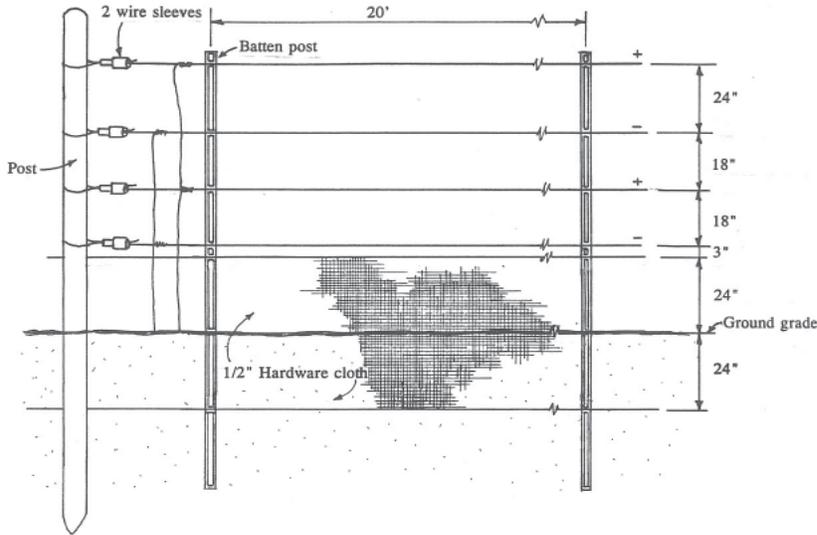
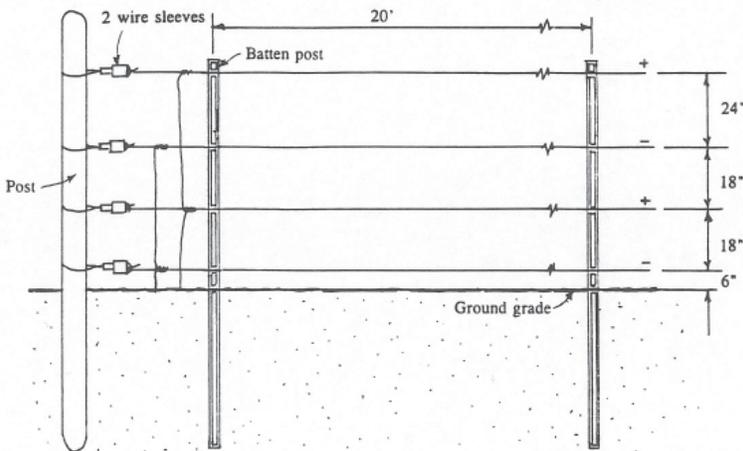


Figure 2. Temporary electric fence.



have also worked well for mice and rabbit control, especially during winter months when there is continual snow cover.

When planting, be careful how you shade your seedlings or you may do more harm than good. Seedlings will be warmer in a box covered with a canvas or plastic tarp than if placed

Planting.

Spring planting conditions are optimal when soil temperatures are 40°F or higher at four to six inches below the soil surface. Plant when the soil has just enough moisture. To determine this, dig a hole. If you don't have enough soil to fill the hole back in, the soil is too wet and you risk poor root-to-soil contact and compaction. If you have a little soil left over, the soil is just right for planting and optimal for plant growth. Very dry conditions require watering immediately after planting.

When your seedlings arrive, inspect them to make sure they are the species you ordered and are in good condition. **Keep your seedlings cool at all times!!** Seedlings can be stored in cold storage at temperatures of 32°F to 35°F for up to six months, or held in a dark, cool place (such as a basement or cellar that is approximately 50°F) for up to one week.

Figure 3. Planting bareroot stock (species with a taproot).

For taprooted species such as oaks and hickories, make the planting hole slightly larger than the spread-out root system. Set the seedling in the hole so the root collar is slightly below the top of the hole. The root collar is the area where the soil surface was at the nursery, usually indicated by a change in the color and texture of the bark. Partially fill the hole, breaking up clods and discarding rocks and debris. Firm the soil around the roots as you continue to fill the hole, making sure the tree is planted straight.

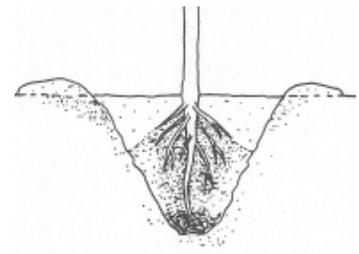
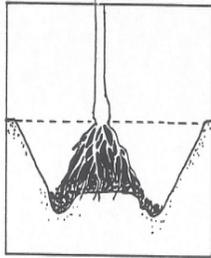
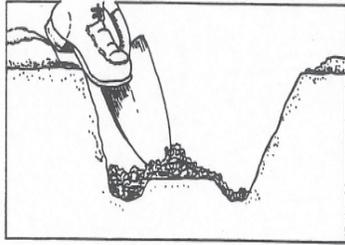
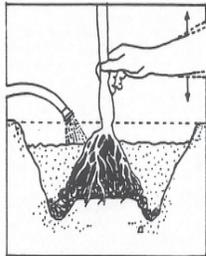


Figure 4. Planting bareroot stock (species without a taproot).

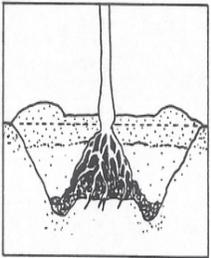
a). to plant bareroot, non-taprooted species such as black cherry, form a cone of soil in the center of the hole. The top of the cone should reach to nearly the top of the hole. Tamp it with your hands to make it firm.



b). Spread the roots over the cone, pointing the tips away from each other and towards the bottom of the hole. Position the biggest root so it is lying in the direction of prevailing winds.



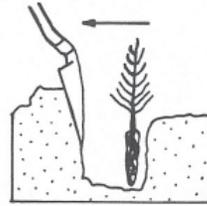
c). Fill the hole with the remaining soil, breaking up any clods and discarding rocks and debris.



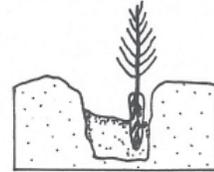
d). Make sure the root collar of the seedling is just below the soil line. The root collar is the area where the soil surface was at the nursery, usually indicated by a change in the color and texture of the bark.

Figure 5. Planting container-grown stock.

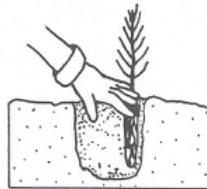
a). With the blade reversed, insert a shovel vertically into the soil and pull soil back and out of the hole. Place the seedling in the hole so that the top of the root plug is at least one-half to one inch below the soil line. Make sure you do not bury any foliage.



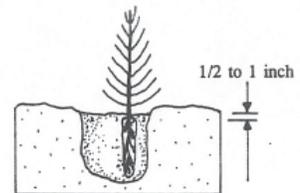
b). Hold the seedling in place and fill the hole half way with moist soil.



c). Finish filling the hole with moist soil, tamping with your hand to make sure the seedling is firmly in place.



d). This properly planted seedling has its original plug of soil buried one-half to one inch below the soil line. None of the foliage is buried.



directly in the sun. The best place for your seedlings is under heavy shade. If there is no shade at the planting site, suspend a tarp at least three or four feet above the box to provide shade while allowing air movement between the box and tarp. If possible, avoid direct exposure to sun or wind.

Dig or auger a hole large enough to accommodate the tree's entire root system, with plenty of room to spread roots out so they do not overlap or "J-root". Check to make sure you haven't "glazed" the sides of the hole, making it difficult for smaller root hairs to penetrate the soil. Always use your

hands to press the soil firmly around the tree to eliminate air pockets and bring roots into contact with the soil, **BUT DO NOT STEP AROUND THE TRUNK OF THE SEEDLING!** This is referred to as the "death stomp" and can be fatal to your tree.

Fertilization.

Fertilizing trees before they are three to five years old is not beneficial unless your soil test shows a serious deficiency. If needed after age five, fertilizer should be applied in the spring as soon as soil is frost-free. Fall applications are not recommended as they can cause trees to break dormancy and cause winter damage on succulent new growth.

Many fertilizer formulations can meet nutrient needs. Fertilizer formulations are described using a series of numbers such as 12-12-12 or 20-12-12. These numbers tell you the percent, in order, of nitrogen, phosphorus, and potassium. These types of products are referred to as complete fertilizers, but do not contain all of the essential elements, although some calcium, magnesium, sulfur, and microelements could be present as carriers.

- o Nitrogen (N) is involved in all physiological processes of a plant. Nitrogen deficiencies will cause a decrease in vigor and yellowing of the foliage, with older leaves showing symptoms first. Excessive nitrogen will cause overabundant growth and decrease flowering and fruiting.
- o Phosphorus (P) is needed for root development, flowering, fruit formation, and is essential for cell division. Phosphorus deficiencies stunt plant growth, with early symptoms being a bronze to purple discoloration of the petioles and underside of leaves, followed by yellowing. Phosphorus deficiencies are rare in trees.
- o Potassium (K) is important in modifying the absorption of other nutrients. Potassium also influences the carbon-nitrogen relationship, and is thought to influence water absorption, which in turn affects drought and cold tolerance. A lack of potassium in broad-leaf plants is first expressed by yellowing, followed by scorching and shedding of the older leaves.

A general application rate for hardwoods is 3 pounds of nitrogen per 1,000 square feet of area under the crown of each tree.

EXAMPLE: a tree with an average crown width of three feet, using a 20-12-12 fertilizer formulation:

$$3' \times 3' = \frac{9 \text{ sq.ft. per tree}}{1,000 \text{ sq.ft.}} = .009 \times 3 \text{ lb N} = .027 \text{ lb N per tree}$$

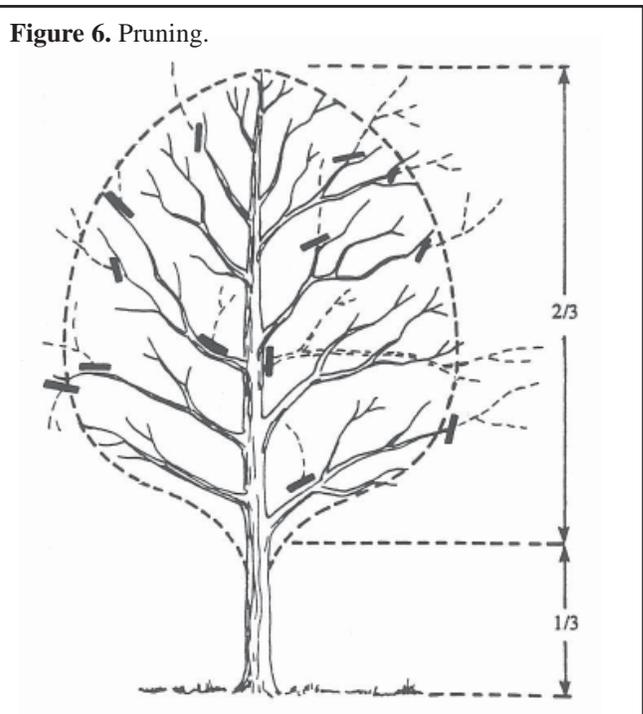
$$.027 \text{ lb N per tree} / .20 = .135 \text{ lb fertilizer per tree}$$

$$.135 \text{ lb fertilizer per tree} \times 300 \text{ trees} = 40.5 \text{ lb fertilizer needed}$$

Another way to determine how much nitrogen to apply is by measuring the diameter of your tree at breast height (DBH), which is four and one-half feet above the ground. For trees under six inches diameter, apply one-quarter pound nitrogen for every inch of diameter. For trees with a diameter greater than six inches, apply one-half pound nitrogen per inch of diameter. Remember to calculate the percentage of nitrogen in the fertilizer formulation you are using to get total pounds fertilizer needed. If you only have a few trees you can use a pre-measured fertilizer product such as Jobe Tree Spikes for Hardwood Trees.

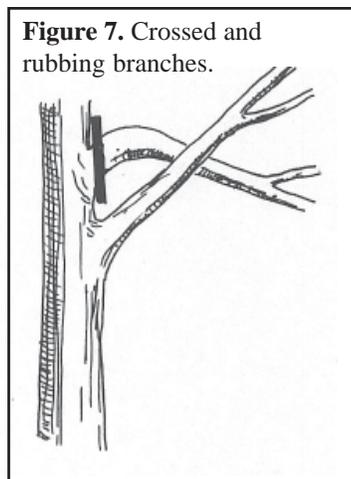
Pruning.

Pruning is a very important aspect of hardwood tree care and maintenance. Too often this job gets put off for too many years and then becomes a huge chore to accomplish. If left too long, the form, health, and vigor of your trees will be affected. Species with a large sap flow in spring, such as beech, birch, and maple, should be pruned in December or January, whereas other hardwood species, such as black cherry, walnut, and oak, can be pruned in February or March. *Clean tools are a must when pruning.* Many diseases can be spread from tree to tree by pruning with infected tools. A



bleach solution (one part bleach to nine parts water) sprayed on your tools between cuts will kill any diseases. When using a bleach solution, thoroughly wash and oil your tools after you have finished the job to prevent rust. Another way to sterilize tools is by using methyl alcohol, found in “winter strength” or undiluted windshield wiper fluid at your local auto supply store.

The first winter, pruning should concentrate on trimming crooked leaders back to upright buds, shortening lateral branches to 10-12 inches (Figure 6). This is also a good time to stake up drooping leaders and remove any crossed or rubbing branches (Figure 7).



branches (Figure 7).

Water sprouts in the interior and sprouts at the base and on the trunk should also be removed (Figure 8). Waterspouts and suckers grow upright rapidly and are weakly attached. They usually use more energy than is

returned to the tree and break easily, providing an entryway for insects and disease.

Successive pruning should concentrate on removing excessive side branches, those that cross or rub other branches and those with narrow crotch angles (Figure 9). Removing the lowest whorl of branches each year will improve the quality of timber eventually harvested from your plantation. Maintaining about a third of the tree height in

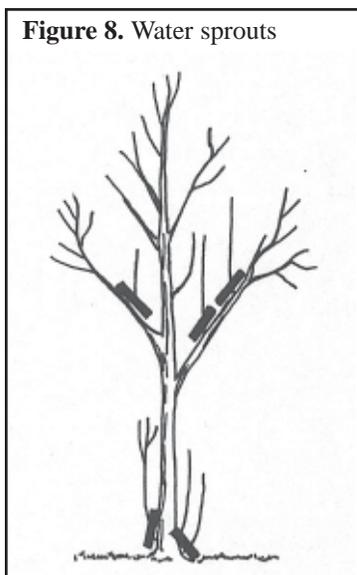
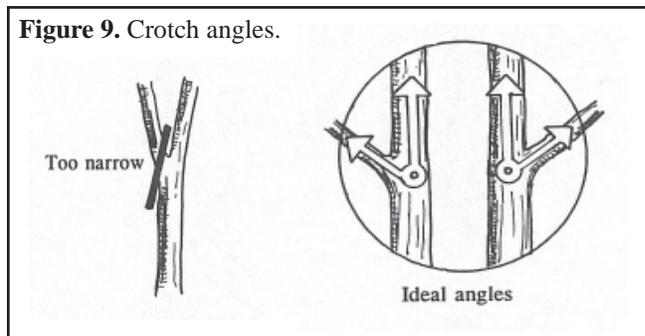


Figure 9. Crotch angles.

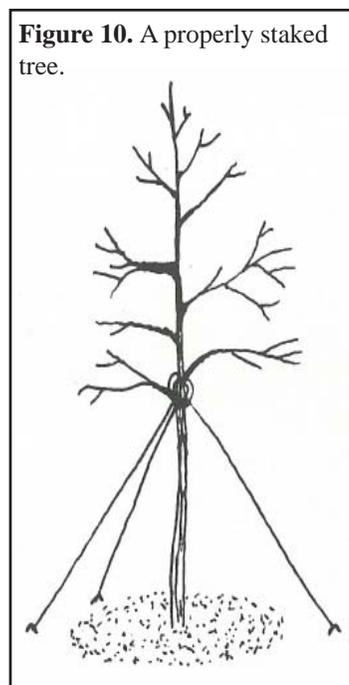


green crown will produce the best growth and form. The application of tree paint to pruning cuts is not recommended.

Staking.

Sometimes a young tree will need additional temporary support to grow upright. Staking tends to promote growth in the upper portion of the tree to the detriment of lower portions. When trees sway in wind, the resulting movement actually encourages the trunk to grow in diameter. When wind movement is decreased or removed, diameter growth will slow down and result in a spindly tree that is unable to support the weight of its own crown. When staking, use two or three stakes for each tree, and protect the tree from being girdled or damaged by running guy wires or ropes through a piece of rubber hose (Figure 10). Attach the guy wires or ropes tightly enough to support the tree, while still allowing some trunk movement. Remove stakes after one or two years.

Figure 10. A properly staked tree.



Sunscald.

Sunscald usually occurs on the south and west sides of a tree’s trunk which is exposed to the sun’s direct afternoon rays (when temperatures

are usually the highest). Symptoms include split bark and dead inner bark, which can provide entry for insects and disease and cause secondary problems that could be fatal. The actual causes of sunscald are unknown, but seem to be related to rapid temperature changes, repeated freezing and thawing, and a bleaching effect caused by intense sunlight. Snow cover can sometimes increase incidence of sunscald by reflecting intense sunlight against trunks. Susceptible species usually have thin, smooth, and often dark-colored bark, and include cherry, beech, oak, and walnut. Young trees are more susceptible than older plants that have developed thicker bark.

Several methods can protect tree trunks from direct, high-intensity sunlight. Tree shelters, milk cartons, boards, burlap sacks, split PVC pipe, shade cards, and other devices are often used to shield trunks from afternoon sun. Be sure to shade only the portion of the plant susceptible to sunscald. For large plantings, white, waterproof tree-wrapping tape is available from horticultural suppliers. When wrapping trees, don't fasten materials tightly around the trunk as this can cause splitting and girdling. Wrapped trunks also provide

a hiding place for boring insects, so wrap should be removed yearly for a complete trunk inspection and rewinding if necessary. You can also protect trees from sunscald by painting the trunk with white interior latex paint, which reflects some of the light and heat generated by sunlight away from the tree. A common recommendation is to shield trunks of susceptible trees two years after transplanting to their permanent location.

Conclusion.

High-value hardwoods can potentially provide an alternative income for many Inland Empire landowners. Used for everything from manufacturing of fine furnishings to making maple syrup, each species is desired for its own particular characteristics and uses. Hardwoods not only provide timber, but also produce fruit and nut crops, contribute to biological diversity and wildlife habitats, are useful in conservation plantings such as windbreaks and riparian plantings, and are aesthetically pleasing. With the right planning, planting, and maintenance you too can enjoy the many benefits of high-value hardwoods.

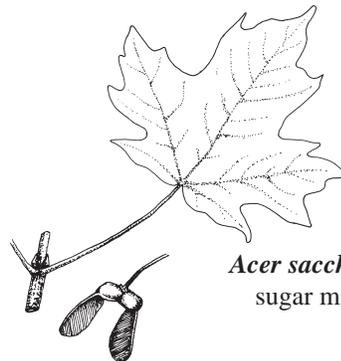
Prunus serotina
black cherry



Juglans nigra
black walnut



Quercus species
oaks



Acer saccharum
sugar maple

