

Department of Horticulture

Purdue University Cooperative Extension Service West Lafayette, IN

Planting & Transplanting Landscape Trees and Shrubs

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Overview

1. Plan before planting. Choose plants that fit your landscape.
2. Handle plants carefully at all times.
3. Plant at the time of year that gives the best chance for success.
4. Make the hole large enough — two to three times wider than the soil ball, the container, or the bare root.
5. Always plant at the same depth at which the tree or shrub was originally growing.
6. Take special precautions when planting in heavy, poorly drained, or sandy soils.
7. During the first year, fertilize only at the first watering.
8. Support tall trees with at least three wires and stakes.
9. Be sure plants get adequate water for the entire first season.

You can increase the value of your property, cut heating and cooling bills, and make your surroundings more pleasant by planting trees and shrubs. It's not hard, but you need to know what, when, and how to plant for success.

What to Plant

Look at the space where you intend to plant the tree or shrub. Estimate the height and diameter of a tree or shrub that will fit there. Check to see if the soil stays wet,

or if it drains quickly. Figure out how much space the roots will have. Ask yourself what role this plant will play in your yard. Will it be the center of attention? Is it part of a living wall that divides one part of the yard from another?

Once you know the function, soil type, sunlight, temperature, water, size, and root requirements for the plant, start thumbing through books and catalogs to find something to fit your need. Then, head out to a nursery to see what they have. Look for healthy, disease- and pest-free plants with well-formed root and branch systems. Resist any temptation to dig your own tree or shrub from the wild. Wild-dug plants often die after transplanting because they lose many roots.

If the site sometimes holds standing water, avoid plants that can't stand "wet feet" (see Table 1).

Once you know what kind of plant you're going to buy, you must decide if you intend to buy a bare-root, machine-balled, balled and burlapped, or containerized plant. How you treat the tree or shrub at planting time will partially depend upon how the roots were prepared for planting.

Table 1. Some commonly used landscape plants that *do not* tolerate wet soils.

Scientific Name	Common Name
<i>Abies concolor</i>	White Fir
<i>Acer saccharum</i>	Sugar Maple
<i>Circidiphyllum japonicum</i>	Katsura tree
<i>Cladrastis lutea</i>	Yellowwood
<i>Cornus florida</i>	Flowering Dogwood
<i>Fagus spp.</i>	Beeches
<i>Hedera helix</i>	English Ivy
<i>Pinus strobus</i>	White Pine
<i>Quercus rubra</i>	Red Oak
<i>Rhododendron sp.</i>	Rhododendrons & Azaleas
<i>Taxus sp.</i>	Yews
<i>Tilia cordata</i>	Littleleaf Linden
<i>Tsuga canadensis</i>	Canada Hemlock
<i>Vinca minor</i>	Myrtle

• **Bare-root** — These are usually the least expensive nursery plants. Nursery workers dig them when they're dormant. You must protect the roots from drying out and from mechanical damage. You should plant them only while they are dormant.

• **Machine-balled** — Nursery workers dig these plants bare-root, then pack the roots in sphagnum peat moss or wood shavings and wrap them in plastic. Handle them carefully to avoid breaking roots. These, too, should be planted while they're still dormant.

• **Balled and burlapped (B & B)** — These plants are dug from a production field with an undisturbed ball of soil around the roots. Workers wrap the soil in burlap, bind them with twine or wire and pin them together with nails. They may place the ball in a wire framework or basket.

• **Containerized plants** — Nurseries sell these in pots. These plants may have grown in the container for a year or more; may have been dug bare-root and planted in the pot earlier that year; or may have been field-grown, dug with a soil ball, and potted. Both B & B and containerized plants usually cost more than bare root plants. However, since you move soil with the roots, the plant is more likely to survive.

Handle balled and burlapped and containerized plants only by the soil ball or pot. Never lift them by the trunk or crown. If you don't plant them immediately, put them in a cool, sheltered area. Water them to keep the soil moist (usually once a day), but don't stand the root ball or the container in water.

You can hold bare-root plants for several days in a cool, sheltered location by covering the roots with a mulch such as sawdust or sphagnum moss. Water them daily, but don't let the roots stand in water. If you plan to hold them without planting for more than a week, "heel in" or temporarily plant the bare-root stock in a sheltered spot. To heel in stock, dig a trench with one sloping side deep enough to accommodate roots (Figure 2). Spread the roots in the trench; rest the trunk against the sloping side. Mulch the roots and the lower stem with soil, sand, sawdust, or sphagnum moss. Keep the mulch moist until you move the plants to a permanent location.



Figure 2. Heel in bare-root stock that you plan to hold for some time before planting in a permanent location.

When to Plant

You should plant most trees and shrubs early in the spring, just before or as new growth starts. Certain tree species essentially demand spring planting, because they establish new roots very slowly (see Table 2).

Most trees and shrubs can also be planted in fall (see table 2 for exceptions.) If you've bought plants in containers or balled and burlapped, you're even less time-bound. Because the soil stays with the roots, you can plant them any time the soil can be worked.

Try to buy plants just before you intend to put them in the ground. Until they're planted, you'll need to protect the roots from damage, such as drying and overheating. See Figure 1 for recommended planting times in Indiana.

Table 2. Some slow-to-root trees that should only be planted in spring.

Scientific Name	Common Name
<i>Acer rubrum</i>	Red Maple
<i>Betula spp.</i>	Birches
<i>Chamaecyparis nootkatensis</i>	Nootka False Cypress
<i>Cornus florida</i>	Flowering Dogwood
<i>Crataegus spp.</i>	Hawthorns
<i>Koelreuteria paniculata</i>	Goldenraintree
<i>Liriodendron tulipifera</i>	Tulip Tree, Tulip-poplar
<i>Magnolia spp.</i>	Magnolias
<i>Nyssa sylvatica</i>	Black Gum
<i>Populus spp.</i>	Poplars
<i>Prunus spp.</i>	Stone fruit (Peach, Cherry, etc.)
<i>Pyrus calleryana</i>	Callery Pear, Including 'Bradford'
<i>Quercus alba</i>	White Oak
<i>Quercus coccinea</i>	Scarlet Oak
<i>Quercus macrocarpa</i>	Bur Oak
<i>Quercus phellos</i>	Willow Oak
<i>Quercus robur</i>	English Oak
<i>Quercus rubra</i>	Red Oak
<i>Salix spp.</i>	Willows
<i>Tilia tomentosa</i>	Silver Linden
<i>Zelkova serrata</i>	Japanese Zelkova

Where to Plant

You're preparing a spot where a tree or shrub may stand for decades, so be sure it is well-drained and well-aerated. Roots need water and air to grow properly.

Soil types vary not only between regions, but also between two spots in a yard. Know your soil conditions before you plant. Check subsurface drainage by digging a hole and filling it with water. If the water doesn't drain away within two hours, you either need to improve the subsurface drainage or select only those plants that can tolerate wet soil.

Improving soil drainage and aeration on a large scale is difficult and expensive. You may need to fill and regrade water-collecting areas, install drain tiles, or incorporate organic matter in conjunction with deep spading or plowing. If you can't extensively rework a poorly drained site, be sure to select plant species that can tolerate soggy or clayey conditions. Follow guidelines in the section "Planting in Heavy Soil."

How to Plant

Preparing the Hole

In loose, well-drained soil, dig the hole two times the width of the root spread, soil ball, or container size of the plant. Dig as deep as the root system, but not much deeper, so that when you have finished planting the tree or shrub is just as deep in the new location as in the old. Flatten the bottom of the hole and stand in it to firm the soil so that the plant doesn't settle in deeper later. If your plant is bare-root, you can make the shape of the bottom of the hole fit the shape of the root system.

In most cases, use the same soil that came out of the hole to backfill; mix topsoil and subsoil together. To avoid burning roots, do not add dry fertilizers or fresh manure to the backfill mix. (If you mix on a sheet of plastic or canvas next to the hole, it's easier to clean up afterwards.)

If you are planting shrubs or small trees in very well-drained or light, droughty soils, thoroughly mix in one part

of a good grade sphagnum peat moss with two parts soil. Such soil amending only marginally helps large trees with extensive root systems. Do not amend backfill soil on a heavy soil site (see "Planting in Heavy Soil").

If you plan to stake the tree, pound stakes into the ground now, before you plant, to avoid damaging roots.

Once the hole is dug, planting instructions will vary according to the type of root preparation your tree or shrub got from the nursery.

Planting Bare-Root and Machine-Balled Stock

On bare-root stock, carefully remove the moist packing material and examine the roots. Cut off damaged roots with a sharp knife or pruners. Soak plant roots in water for several minutes immediately before planting, but don't let roots stand in water for more than an hour.

You must always protect the plant's roots from drying. Even while you're digging the hole, keep roots covered with damp burlap, moist sphagnum moss, or other material to avoid exposing roots to sun and air.

For machine-balled stock, dig the hole before you remove the plastic wrap. After you take the wrapping material off of the root ball, pull the peat ball apart gently to let roots contact soil. Be careful to keep roots intact. Plant immediately.

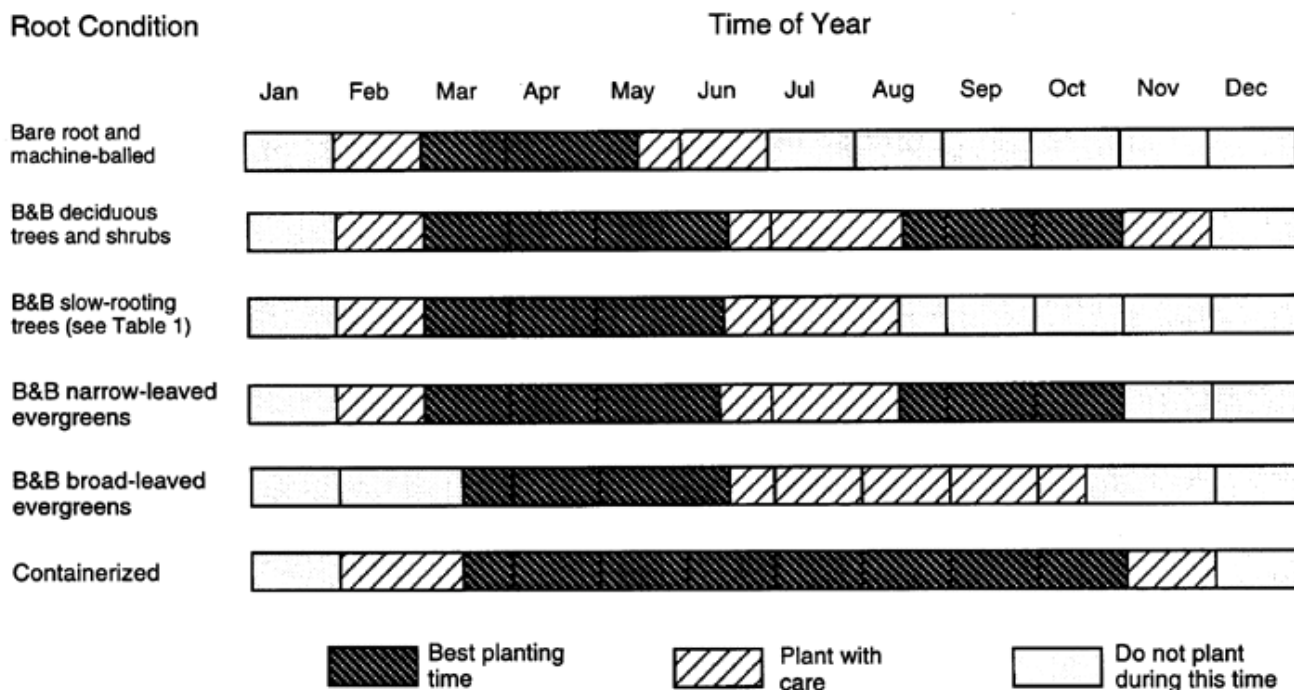


Figure 1. Plant nursery stock at the preferred or acceptable planting times in central Indiana. Adjust for far northern or southern locations.

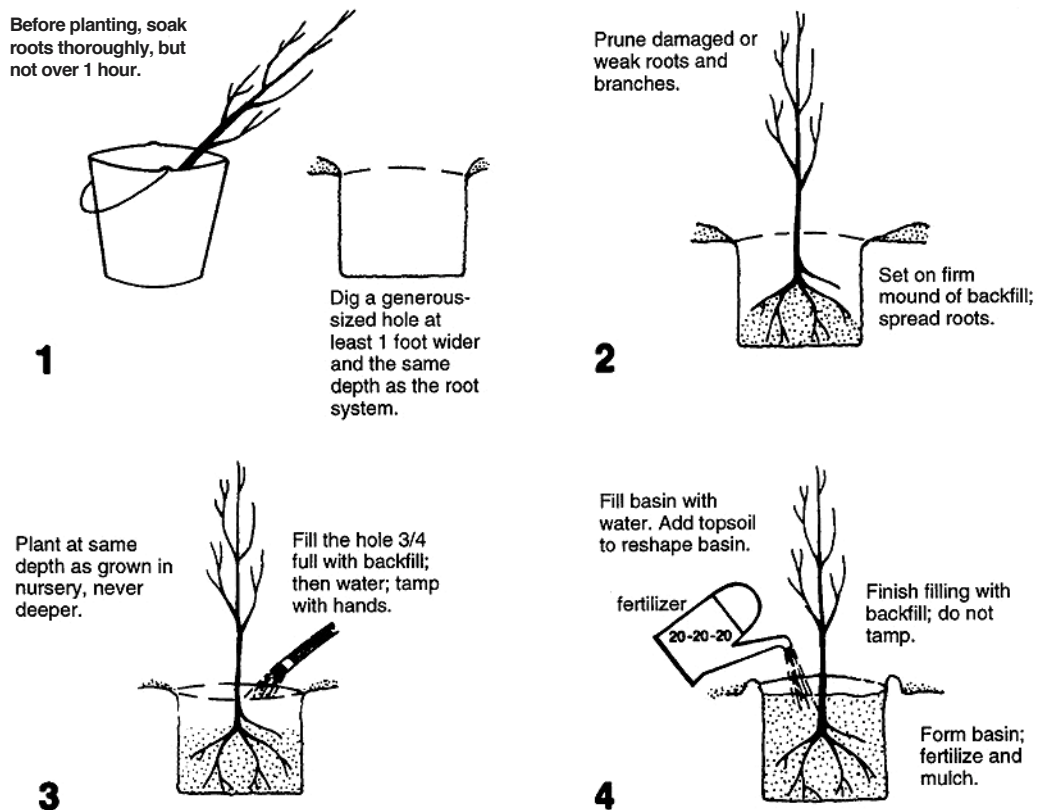


Figure 3. Proper planting of a bare-root plant in well-drained soil.

For both bare-root and machine-balled plants, be sure the plant sits at exactly the same level in the new hole as it did where it grew before (Figure 3). Stand it in the center of the hole and carefully backfill with soil. Work the soil in and around the roots, then firm it with your hand. Continue filling the hole until it is three-fourths full. Gently tamp the soil with your feet, but don't pack the soil or break roots.

After the hole is three-fourths full, fill it full of water and let the water drain. This settles the soil and eliminates air pockets around the roots. *Do not* pack the soil after it is watered. Straighten the plant if it's crooked, and finish filling the hole.

To catch and hold rain water and to make watering easier, form a 2- to 3-inch rim of soil in a circle 2-3 feet larger than the diameter of the hole (Figure 4). Prepare a fertilizer solution with a water soluble fertilizer (20-20-20 or similar analysis). Use the rate recommended on the label. Fill the basin with the fertilizer solution, usually 2 to 3 gallons for each plant. Additional fertilizer is not needed during the first growing season.

After watering, add 2- to 3-inches of bark mulch or other coarse material over the entire watering basin. Keep all mulch away from the trunk of the tree and the stems of shrubs. For the first year, maintain the soil rim around the basin to catch rain or irrigation water.

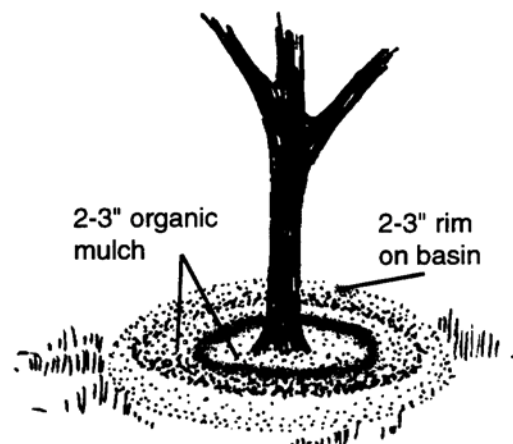


Figure 4. Finish your planting job by creating a watering basin and mulching.

Planting Balled and Burlapped Stock

Always handle balled and burlapped stock by the soil ball, never by the trunk or crown of the plant.

Stand the plant in the prepared hole (see "Preparing the Hole" above) so that the top of the soil ball is level with the surrounding soil surface, never deeper (Figure 5).

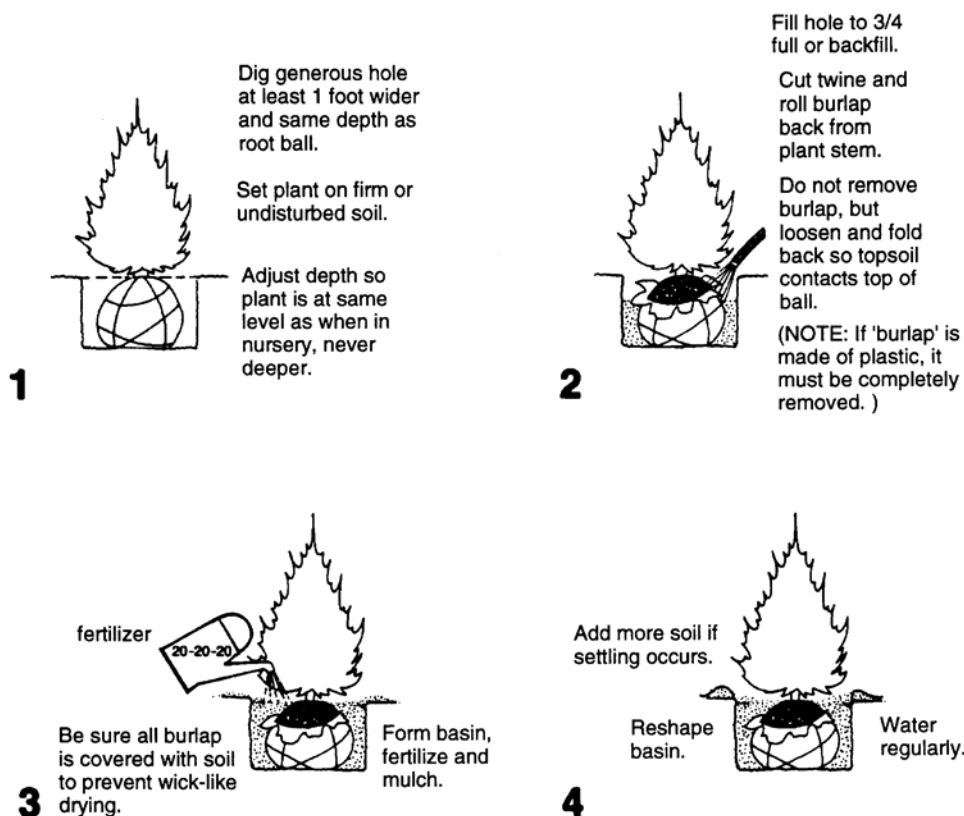


Figure 5. Handle balled and burlapped plants carefully and plant in well-drained soil. Lift or carry the plant by holding the soil ball, not the stem or branches.

Backfill the hole three-fourths full. Cut all twine or wire away from the top of the soil ball and the trunk. Completely remove wire baskets, if practical. However, removing them from large soil balls may cause the ball to fall apart. Evidence suggests that wire baskets do not cause long-term problems for plant growth, as long as the wire is well below the ground. Roll back the burlap to below the soil surface. (Note: if the "burlap" is made of plastic, you must completely remove it.) Fill the hole with water to settle the backfill. Finish by filling the hole, but do not pack or tamp this soil. Finally, prepare a basin, then mulch and fertilize as described for a bare-root plant.

Planting Containerized Stock

Dig the hole before you remove the container. Also, thoroughly water the containerized plant.

You must remove metal or plastic containers completely. Plants have likely been in those containers for a full growing season and have a dense root ball. Turn the container upside-down and give the rim a sharp tap. The root ball should fall out in one piece.

Before you put the root ball in the prepared hole, cut any long roots that completely encircle the root ball. Gently pull other roots away from the ball and spread them out.

This will allow you to place backfill soil directly around those roots. Finish planting, mulching, and fertilizing as described for B & B stock. (Figure 6)

The root ball of plants in papier-mache or other degradable containers will be loose because the plant has been in the pot for less than a full growing season. The soil will probably fall away from the roots if you take them out of the pot. Instead, position the pot in the prepared hole the correct depth (Figure 7). Tear away any part of the pot that extends above the soil line. Use a sharp utility knife to slash the pot vertically in five or six places. Backfill immediately while the form of the pot and soil ball are undisturbed. Complete the job by mulching and fertilizing as described previously.

Planting in Heavy Soil

If you want plants to survive in heavy, clayey soil, you must pick plants that can tolerate these conditions. You won't have as many plant species to choose from, but if you choose well-adapted plants they should survive with minimal maintenance.

Dig the hole at least three times the diameter of the root ball. Use the soil from the hole to backfill. You may be tempted to dig a big hole for the tree or shrub, plant, then

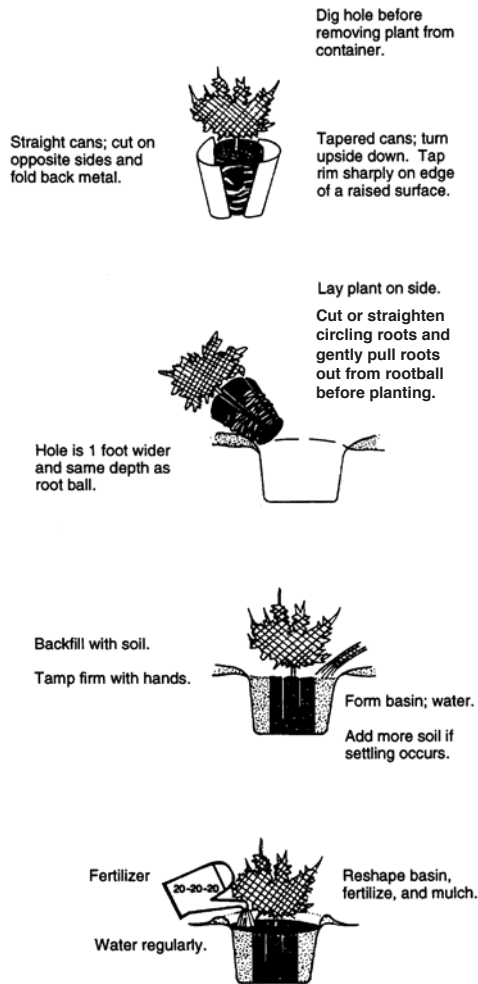


Figure 6. Roots of container-grown stock usually bind the soil. Remove rigid containers before planting. Cut off any encircling roots.

fill in with lighter soil or an amended soil mix. However, if you do, you likely will create a bowl that catches and holds too much water, suffocates roots, and kills the plant.

If you absolutely must plant species of small ornamental trees or shrubs that require excellent drainage in poorly drained soils, create a raised bed for them. Plan for a bed at least 6- to 8-inches high and at least 4 feet wide for a shrub or 8 to 10 feet wide for a small ornamental tree. To build a raised bed, rototill or hand spade the existing soil. Then place a 3- to 4-inch layer of well-drained soil on top (Figure 8). Spade or rototill the added soil in place.

Follow with a second 3- to 4-inch layer of soil and a final pass with the rototiller. You can build a wall around the raised bed to prevent the soil from eroding away; however, where space permits, slope the bed's outer edges to the original level of the soil.

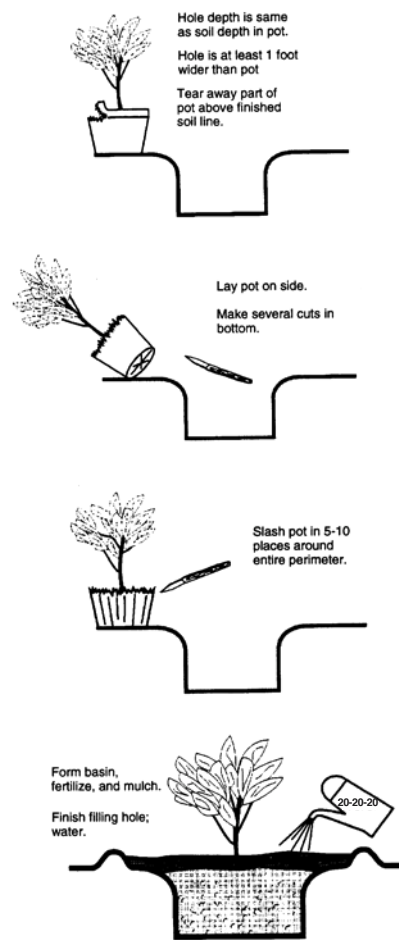


Figure 7. Do not remove plant from papier-mache or "plantable" container. Instead slash the pot just prior to backfilling.

Planting in Excessively Sandy or Light Soil

For extremely sandy "light" soil, prepare a backfill mixture of one part sphagnum peat moss and two parts original soil (Figure 9). You can dig the hole larger than generally recommended, but, as always, set the plant no deeper than it had originally been growing. Backfill with the prepared mix and add at least a 3-inch layer of mulch outward from the trunk to a point 6 inches beyond the width of the planting hole. Water thoroughly once a week. Because sandy soil does not retain nutrients well, be sure to include water-soluble fertilizer in the first watering and again once or twice during the first season. You may need to water regularly for the first few years.

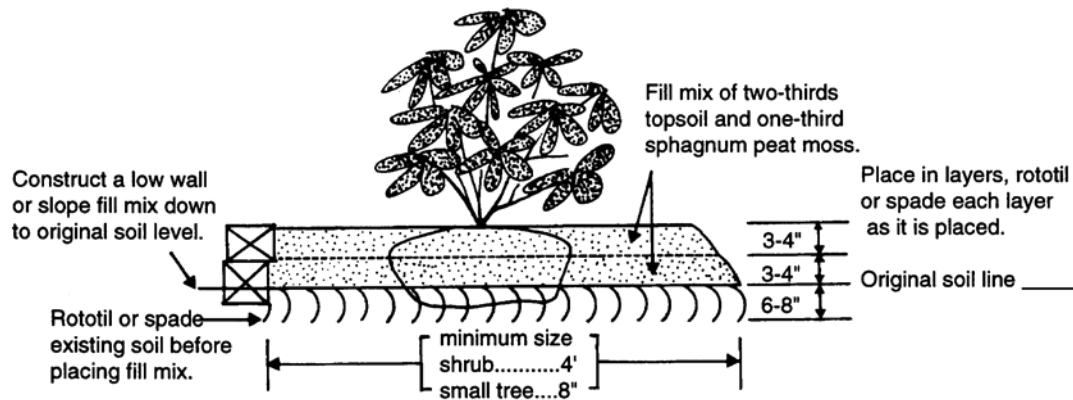


Figure 8. You may choose to construct a raised bed on poorly drained soil.

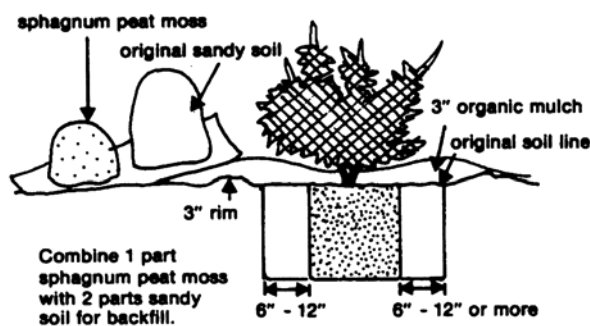


Figure 9. You may choose to add peat moss when planting in very sandy soil.

wire loop around the tree at the lowest branch crotches. Make loops around the trunk very loose to avoid damaging the tree. Drive stakes into firm soil at least 18 inches outside the perimeter of the planting hole. Anchor the loose ends of the wires securely to stakes. Various fabric straps and rigid staking systems are available that may be easier to use than hose and wire.

Don't forget to remove the stakes and guys before the wire girdles the trunk. Generally, remove supports after one growing season for a 1-inch diameter tree, two seasons for a 2-inch diameter tree. For larger trees, guys may need to remain for three seasons or more. They should be inspected annually and adjusted to prevent trunk girdling.

After You Plant

Pruning

Planting time is excellent for pruning off diseased or damaged branches, basal (sucker) shoots, and limbs with extremely narrow crotch angles. For shade trees, you can take this time to select major scaffold limbs to keep, then prune out excess branches. (Figure 10) Refer to HO-4 for details on pruning.

Staking and Guying

To keep trees from tipping and the roots from moving too much, stake any bare-root tree larger than 6-feet tall, and balled and burlapped trees larger than 10-feet tall (Figure 11). Small trees usually don't need the support.

Drive stakes into the undisturbed ground before you backfill the hole, to be sure you don't drive the stakes through the root ball and damage the roots.

Larger trees should be guyed. To guy a tree, use three wires attached to three stakes. Thread a one foot piece of hose on each wire and have the hose-covered bit of

Trunk Wrapping

In the late fall, wrap newly planted trees, especially thin barked trees like red maple, with a light-colored, commercially available tree wrap to provide winter protection from sunscald. Remove the wrapping material in spring. Wrap trees each fall until the bark is rough and corky.

Start the wrap at the base of the tree, and extend it to the first limb. Spiral the wrap around the trunk with each turn overlapping the previous turn by half the width of the material. Secure the wrap with tape, twine, or by looping it back on itself.

You may want to surround the lower part of the trunk with wire or plastic guards to discourage rabbits and rodents that eat bark.

Watering

If you want your newly planted trees and shrubs to survive their first year, you've got to be sure they get the right amount of water. Overwatering is just as harmful as underwatering. How often and how much you water depends upon your soil type and the amount of rainfall.

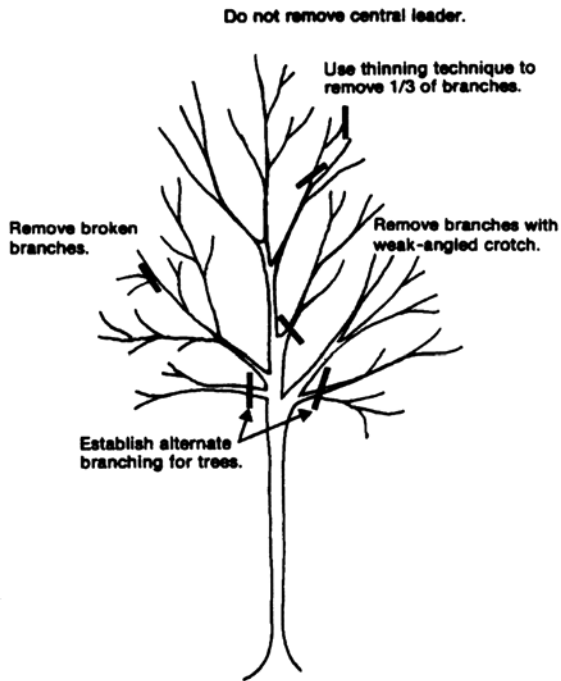


Figure 10. Top prune newly planted bare-root trees and shrubs.

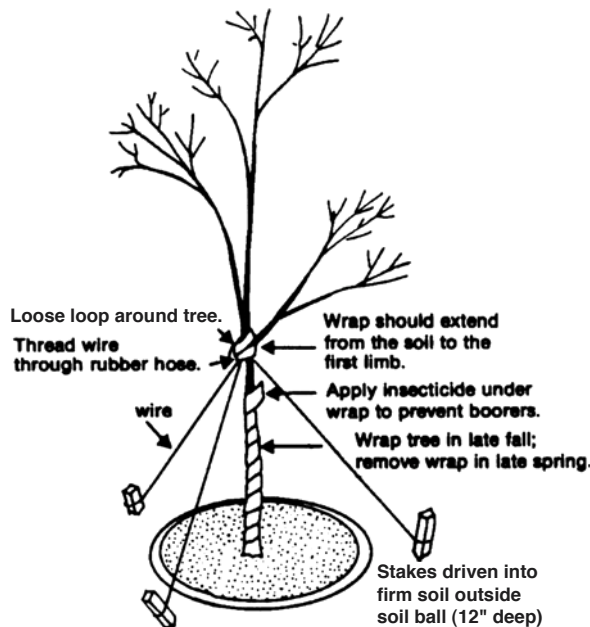


Figure 11. Stake and wrap large trees.

On well-drained soils, apply 1 inch of water per week in summer and fall. On sandy soils, give plants at least 2 inches of water per week, preferably in two 1-inch applications. Plants in poorly drained, clay soils need less frequent watering.

Water regularly and supplement brief rain showers. If you get a heavy rain (2 or more inches), you may still need to water the following week. Often much of a heavy rain runs off. If you use a lawn sprinkler, put a straight-sided can near the tree or shrub and water until the can contains one inch of water.

Transplanting

Sometimes you must move a small tree or shrub from one spot to another in a yard. (Leave relocation of large trees to landscape professionals.) It's best to think ahead. Two years before the move, start pruning roots in early fall while trees are still growing. This gives the plant the best chance for survival following the move. If you don't root-prune the plant before the move, it may still survive, but the chances of success are reduced.

To prune roots of small trees, first measure the trunk diameter at your waist height. Then, measure out 9 inches from the trunk for each inch of diameter. For example, a tree with a diameter of 1-1/2 inches should be root pruned 13-1/2 inches from the trunk. For shrubs, make the root-pruning cut half the distance of the radius of the branch spread of the shrub. For example, a shrub with a spread of 36 inches from the center to the outermost branches should be root pruned to 18 inches.

When plants are dormant during the first year, cut straight down around two quarters of the plant on two opposite sides (Figure 12). Use a sharp spade to cut 18 inches deep. During the second year, cut around the remaining two quarters of the perimeter of the dormant plant. This two-year process cuts off many long roots and encourages new roots to grow in the soil ball. Move the plant during the third season.

When you're ready to move a plant, tie the branches to the central trunk. Then start digging 6 inches further away from the trunk than the root-pruning line. Dig a hole 18 inches deep. When the circular hole is completely finished, gently rock the plant (with the soil ball attached) from side to side. Cut the roots on the bottom of the soil ball and slide burlap under the ball.

Grasp all four corners of the burlap, and lift the soil ball out of the hole. Wrap the burlap tightly around the soil ball. Tie the burlap so it cannot get loose in handling. Handle the plant carefully, by lifting the soil ball, not the trunk. Do not break the soil ball! Plant as described above.

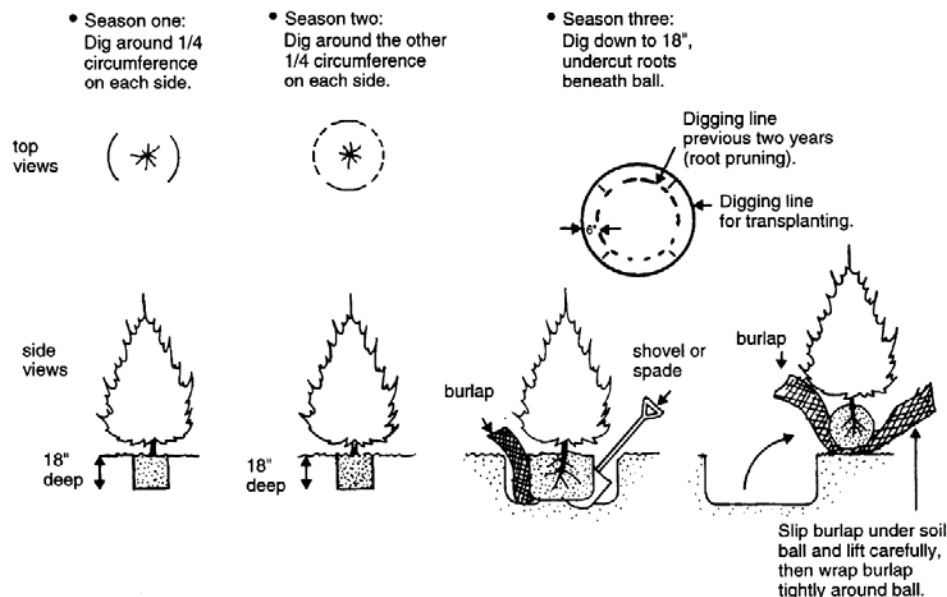


Figure 12. Before digging and moving a tree or shrub, root-prune for two years and transplant during the third.

RELATED PUBLICATIONS

HO-4: Pruning

<http://www.hort.purdue.edu/ext/HO-4.pdf>

HO-222: Landscape Plants for Shady Areas

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_222.pdf

HO-223: Landscape Plants for Areas with Full Sun

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_223.pdf

HO-224: Landscape Plants for Acid Soils

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_224.pdf

HO-225: Landscape Plants for Sandy Soils

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_225.pdf

HO-226: Landscape Plants for Moist to Slightly Moist Areas

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_226.pdf

HO-227: Landscape Plants for Wet Areas

http://www.hort.purdue.edu/hort/ext/Pubs/HO/HO_227.pdf

BP-31: Transplant Shock of Trees and Shrubs

<http://www.agcom.purdue.edu/AgCom/Pubs/BP/BP-31.html>

BP-2: Winter Injury of Ornamentals

<http://www.agcom.purdue.edu/AgCom/Pubs/BP/BP-2.html>

Transplanting Trees and Shrubs, University of Kentucky

<http://www.ca.uky.edu/agc/pubs/id/id80/id80.htm>

Establishing Fruit and Shade Trees

http://www.cahe.nmsu.edu/pubs/_h/h-420.html

* Becky Goetz and Janie Nordstrom Griffiths assisted in the revision of this publication.

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