

PLANTING TECHNIQUES

Once a site has been chosen for planting a new tree, it is important that careful consideration be given to the actual installation technique in order to ensure the tree's survival. Since most trees will be transplanted from a nursery setting where they have received scheduled care and nurturing, it is critical to follow proper planting methods to reduce the shock of transplanting and establishment. Whether the planting will be done by community volunteers or hired contractors, it is important to plant the tree correctly, giving it the best chance for a long and healthy life. The following information outlines some recommendations for planting balled and burlapped, and bare root trees.

Techniques for Planting Balled and Burlapped Trees

Using a step-by-step process to plant trees will help ensure that they have an opportunity for survival and healthy growth. According to the International Society of Arboriculture, the root system of a balled and burlapped tree has been reduced by 90–95 percent of its original size. This dramatic shock to the tree's physiology often results in slow growth and reduced vigor following transplanting. Proper preparation of the site is critical to minimize the rigors of transplanting a tree from a nursery into your landscape.

If possible, prepare the site before you bring in the tree. Keep the root ball well watered and put the tree in a shaded spot until you are ready to plant. In order to measure the proper depth for the planting site, it is necessary to expose the trunk flare on each balled and burlapped tree. The trunk flare is the point where roots begin to branch from the trunk. (The top of the root ball is not always the trunk flare.) Remove the burlap from the immediate trunk area of the tree. Pull back any excess soil around the trunk to locate the trunk flare. Measure the distance from the base of the trunk flare to the bottom of the root ball and dig to that depth. The hole should be at least three times the diameter of the root ball, with the sides of the excavated area at a 30-degree angle

In addition, you will need to break up compacted soil. The sides of the planting space should not be packed. Leave the bottom of the space firm. Do not amend the soil unless planting in building rubble, or in poor or severely disturbed soils.

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When actually planting the tree, it is important to follow these simple steps:

- Lift the tree into the planting space by the root ball, not the trunk.
- Balance the tree upright in the center of the planting space.
- For trees in wire baskets, cut and remove the wire.
- Cut away strings and burlap or plastic, exposing the root ball. Do not remove soil from the root ball.
- If the tree is container grown, cut and remove the container.
- Prune dead or crushed roots and straighten or cut circling roots. Make clean cuts.
- Begin refilling with soil, watering as you fill to firmly set the tree. Gently tamp the soil.
- Never plant too deep. The trunk flare should be at grade. Fill with soil up to the tree base just to where the roots begin to branch from the trunk
- Prune only dead or injured branches. Do not paint wounds.
- Remove tree wrap, tape, or string on the trunk. Trunks should be wrapped only to protect them in transit to the planting site.
- Stake and brace large trees, or trees that are planted in a windy, exposed location. Support the tree but allow it to move or sway.
- Use wide, belt-like strapping attached to two sturdy stakes. Do not use rope or wire through a hose.
- Mulch lightly and evenly with 2” of composted material to at least the diameter of the crown of the tree. Leave a 3” circle of bare soil around the trunk. Deep layers of mulch can be harmful.
- Do not plant flowers under the tree.
- Do not fertilize at planting time.

Improper planting depth and excess mulch are often the cause for predisposing new transplants to not only immediate, but also future, cultural, insect, and disease problems.

Special attention is necessary to ensure that a tree is not planted too deep. Many times a landscape professional correctly plants to the top of the root ball, and sometimes even plants 1–2” high to allow for landscape mulch and a little settling. But balled and burlapped trees are often handled many times between the wholesale nursery and the landscape site. This handling causes the soil within the ball to be pulled up around the trunk. Unless this excess soil is removed down to the stem flare or root collar, trees are likely to be planted 2–3” too deep.

Excess mulch can also decrease a tree’s ability to thrive. The proper use of landscape mulch is to simulate the leaf or duff layer found in the tree’s natural setting, which provides organic matter, increases moisture retention in the soil, and regulates soil temperature fluctuations. Landscape mulches also reduce the growth of weeds and grass, eliminating the potential for mower injury to the trunk. Landscape mulches should never be applied at a depth exceeding the 2–3” layer that occurs in the natural environment and should never touch the trunk.

Excess soil and mulches around the stem and root zone areas decreases the ability of the roots to obtain oxygen. This adversely affects root growth, thus reducing the tree’s ability to collect water and nutrients. Furthermore, excess soil and mulch around the tree’s stem causes the bark to be constantly wet, which can reduce the tree’s cold tolerance, encourage fungal pathogen and insect invasions, reduce incremental growth, and lead to adventitious and girdling roots.

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Assuring proper planting depth and maintaining proper mulching practices will greatly decrease future therapeutic maintenance while enhancing the tree's ability to thrive, thus allowing it to become a beautiful asset to the landscape.

Fertilization is usually not necessary or recommended at planting time. If it is desired or necessary, use fertilizer that is organic or slow release. Pruning at planting time should be limited to removing only broken or misshapen branches.

Bare Root Planting

Bare root trees are dug and stored without any soil around their roots, which allows for more roots to be saved while transplanting from the nursery to a new planting site. According to some estimates, bare root trees can have up to 200 percent more roots than container trees, depending on the soil type and transplanting method used at a particular nursery. Also, since the soil is left at the nursery, only the tree and its roots need to be handled and shipped, making these trees much lighter and less expensive, and cheaper to transport. Bare root trees are also easier to plant, making this type of tree more appealing to volunteer initiatives, which rely on community members to do much of the physical labor involved in planting trees.

Bare root planting is not without some disadvantages, but with careful planning and scheduling, many of these issues can be easily overcome. The use of bare root trees reduces the window of time available for planting. Once bare root trees have been dug and shipped from the nursery, they need to be planted within 7 to 10 days, depending on the air temperature and weather conditions. Since there is no soil around the root, the small feeder roots and root hairs will dry out and die if left exposed, making it important to plant the tree as soon as possible.

Bare root trees need plenty of soil moisture in order to establish themselves in a new planting location, therefore early spring (before budbreak) and fall (after leaf fall) are the only two possible planting times. Some species may not be available as bare root trees, and some nurseries may not have bare root trees available for retail sale at all. The best techniques for bare root tree planting are as follows:

- Use any technique you can to reduce the time the tree roots are bare.
- Order 1½–2" trees to be dug within 24 hours of your arrival; otherwise, be sure they have been stored in a cool place.
- Have spring trees dug in late March to early May and fall trees dug in mid-October to late November.
- If possible, dip tree roots in a hydrogel (a synthetic water-absorbing compound) slurry or muddy water, then store them in large, pleated plastic bags until planting.
- If no hydrogel is used, soak the tree roots in water for 12–24 hours before planting.
- Keep the trees covered, shaded, and moist until actual planting.

Tree Selection

Tree selection is one of the most important investment decisions a home owner makes when landscaping a new home or replacing a tree lost to damage or disease. Considering that most trees have the potential to outlive the people who plant them, the impact of this decision is one that can influence a lifetime. Match the tree to the site and both lives will benefit.

Plant Materials

The question most frequently asked of tree care professionals is “What tree do you think I should plant?” Before this question can be answered, a number of factors need to be considered. Think about the following questions:

- Why is the tree being planted? Do you want the tree to provide shade, fruit, or seasonal color, or act as a windbreak or screen? Maybe more than one of the above?
- What is the size and location of the planting site? Does the space lend itself to a large, medium, or small tree? Are there overhead or below ground wires or utilities in the vicinity? Do you need to consider clearance for sidewalks, patios, or driveways? Are there other trees in the area?
- What type of soil conditions exist? Is the soil deep, fertile, and well drained or is it shallow, compacted, and infertile?
- What type of maintenance are you willing to provide? Do you have time to water, fertilize, and prune the newly planted tree until it is established or will you be relying on your garden or tree service for assistance?

Asking and answering these and other questions prior to beginning the selection process will help you determine the “right tree for the right place.”

Tree Function

Trees make our environments more pleasant. Properly placed and cared for, trees increase the value of our real estate. A large shade tree provides relief from summer’s heat and, when properly placed, can reduce summer cooling costs. An ornamental tree provides beautiful flowers, leaves, bark or fruit. Evergreens with dense, persistent leaves can be used to provide a windbreak or a screen for privacy. A tree that drops its leaves in the fall allows the sun to warm a house in the winter. A tree or shrub that produces fruit can provide food for the owner and/or attract birds and wildlife into your home landscape. Street trees decrease the glare from pavement, reduce runoff, filter out pollutants, and add oxygen to the air we breath. Street trees also improve the overall appearance and quality of life in a city or neighborhood.

Form and Size

Frank Lloyd Wright, the famous architect, once made the comment, “form follows function.” This is a good rule to remember when selecting a tree. Selecting the right form (shape) to complement the desired function (what you want the tree to do) can significantly reduce maintenance costs and increase the tree’s value in the landscape. When making a selection about form, also consider mature tree size. Trees grow in a variety of sizes and shapes, as shown below. They can vary in height from several inches to several hundred feet. Select a form and size that will fit the planting space provided.

Depending on your site restrictions, there are hundreds of combinations of form and size to choose from. You may choose a small spreading tree in a location with overhead utility lines. You may select a narrow columnar form to provide a screen between two buildings. You may choose large vase-shaped trees to create an arbor over a driveway or city street. You may even determine that the site just does not have enough space for a tree of any kind.

Plant Materials

Site Conditions

Selecting a tree that will thrive in a given set of site conditions is the key to long-term tree survival. The following is a list of the major site conditions to consider before selecting a tree for planting:

- Soil Conditions
- Exposure (sun and wind)
- Human Activity
- Drainage
- Space Constraints
- Hardiness Zone

Soil Conditions. The amount and quality of soil present in your yard can limit planting success. In urban sites, the topsoil often has been disturbed and frequently is shallow, compacted, and subject to drought. Under these conditions, trees are continuously under stress. For species that are not able to handle these types of conditions, proper maintenance designed to reduce stress is necessary to ensure adequate growth and survival. Many arborists will, for a minor charge, take soil samples from your yard to test for fertility and pH (alkalinity or acidity). The tests will be returned with recommendations on ways to improve poor soil conditions with fertilizers or soil amendments (sand, peat moss, or manure) and will also help your local nursery or garden center recommend tree species that will do well in the soils found on your site.

Exposure. The amount of sunlight available will affect tree and shrub species selection for a particular location. Most woody plants require full sunlight for proper growth and flower bloom. Some do well in light shade, but few tree species perform well in dense shade. Exposure to wind is also a consideration. Wind can dry out soils, causing drought conditions, damage to branches and leaves during storms, and actually uproot newly planted trees that have not had an opportunity to establish root systems. Special maintenance, such as staking or more frequent watering, may be needed to establish young trees on windy sites.

Human Activity. This aspect of tree selection is often overlooked. The reality of the situation is that the top five statistics related to tree death are caused by people. Soil compaction, underwatering, overwatering, vandalism, and the number one cause - planting the wrong tree, account for more tree deaths than all insect and disease-related tree deaths combined.

Drainage. Tree roots require oxygen to develop and thrive. Poor drainage can remove the oxygen available to the roots from the soil and kill the tree. Before planting, dig some test holes 12” wide by 12” deep in the areas you are considering planting trees. Fill the holes with water and time how long it takes for the water to drain away. If it takes more than 6 hours, you may have a drainage problem. If this is true, ask your local garden center for recommendations on how to correct the problem, or choose a different site.

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Space Constraints. Many different factors can limit the planting space available to the tree: overhead or underground utilities, pavement, buildings, other trees, visibility - the list goes on and on. Make sure there is adequate room for the tree you select to grow to maturity, both above and below ground.

Hardiness. Hardiness is the plant's ability to survive in the extreme temperatures of the particular geographic region in which you are planting the tree. Plants can be cold hardy and/or for southern regions, heat tolerant. Most plant reference books will provide a map of hardiness zone ranges. Check with your local garden center for the hardiness information for your region. Before you make your final decision, make sure the plant you have selected is "hardy" in your area.

Pest Problems

Insect and disease organisms affect almost every tree and shrub species. Every plant has its particular pest problems, and the severity varies geographically. These may or may not be life threatening to the plant. You should select plants resistant to pest problems for your area. Your local ISA Certified Arborist, tree consultant, or cooperative extension agent can direct you to information relevant to problem species for your location.

Species Selection

Personal preferences play a major role in the selection process. Now that your homework is done, you are ready to select a species for the planting site you have chosen. Make sure you utilize the information you have gathered about your site conditions, and balance them with the aesthetic decisions you make related to your personal preferences. The species must be suitable for the geographic region (hardy), tolerant to the moisture and drainage conditions of your soil, resistant to pests in your area, and have the right form and size for the site and function you have envisioned. Remember, that beautiful picture of the tree you looked at in the magazine or book was taken of a tree that is growing vigorously because it was planted in the right place. If your site conditions tell you the species you selected will not do well under those conditions, do not be disappointed when the tree does not perform in the same way.

If you are having difficulty answering any of these questions on your own, contact your local ISA Certified Arborist, tree care professional, garden center, or county extension agent for assistance. Their assistance will help you to plant the "right tree in the right place." It is better to get them involved early and make the right decision, to avoid having to call them later to ask them if you made the wrong decision.

New Tree Planting

Think of the tree you just purchased as a lifetime investment. How well your tree and investment grows depends on the type of tree and location you select for planting, the care you provide when the tree is planted, and follow-up care the tree receives after planting.

Plant Materials

The ideal time to plant trees and shrubs is during the dormant season ? in the fall after leafdrop or early spring before bud-break. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. However, trees properly cared for in the nursery or garden center, and given the appropriate care during transport to prevent damage can be planted throughout the growing season. In either situation, proper handling during planting is essential to ensure a healthy future for new trees and shrubs. *Before you begin planting your tree, be sure you have had all underground utilities located prior to digging.*

If the tree you are planting is balled and burlapped, or bare rooted, it is important to understand that the tree's root system has been reduced by 90-95% of its original size during transplanting. As a result of the trauma caused by the digging process, trees will commonly exhibit what is known as transplant shock. Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before and during planting coupled with good follow-up care will reduce the amount of time the plant experiences transplant shock and will allow the tree to quickly establish in its new location. Carefully follow eight simple steps and you can significantly reduce the stress placed on the plant at the time of planting.

“It's better to put a \$100 tree in a \$200 hole than to put a \$200 tree in a \$100 hole.”

1. Dig a shallow, broad planting hole. Make the hole wide, as much as three times the diameter of the root ball, but only as deep as the root ball. It is important to make the hole wide because the tree roots on the newly establishing tree must push through surrounding soil in order to establish. On most planting sites in new developments, the existing soils have been compacted and are unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides the newly emerging roots room to expand into loose soil to hasten establishment.

2. Identify the trunk flare. The trunk flare is where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). If the trunk flare is not partially visible, you may have to remove some soil from the top of the root ball. Find it so you can determine how deep the hole needs to be for proper planting.

3. Place the tree at the proper height. Before placing the tree in the hole, check to see that the hole has been dug to the proper depth and no more. The majority of the roots on the newly planted tree will develop in the top 12 inches of soil. If the tree is planted too deep, new roots will have difficulty developing due to a lack of oxygen. It is better to plant the tree a little high, 2-3 inches above the base of the trunk flare, than to plant it at or below the original growing level. This will allow for some settling (see diagram). To avoid damage when setting the tree in the hole, always lift the tree by the root ball and never by the trunk.

4. Straighten the tree in the hole. Before you begin backfilling have someone view the tree from several directions to confirm the tree is straight. Once you begin backfilling it is difficult to reposition.

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5. Fill the hole, gently but firmly. Fill the hole about 1/3 full and gently but firmly pack the soil around the base of the root ball. Then, if the tree is balled and burlapped, cut and remove the string and wire from around the trunk and top 1/3 of the root ball (see diagram). Be careful not to damage the trunk or roots in the process.

Fill the remainder of the hole taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.

6. Stake the tree, if necessary. If the tree is grown and dug properly at the nursery, staking for support is not necessary in most home landscape situations. Studies have shown that trees will establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. However, protective staking may be required on sites where lawn mower damage, vandalism or windy conditions are concerns. If staking is necessary for support, two stakes used in conjunction with a wide flexible tie material will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram). Remove support staking and ties after the first year of growth.

7. Mulch the base of the tree. Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold moisture, moderate soil temperature extremes, both hot and cold, and reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or wood chips. A two to four inch layer is ideal. More than four inches may cause a problem with oxygen and moisture levels. When placing mulch, care should be taken so that the actual trunk of the tree is not covered. This may cause decay of the living bark at the base of the tree. A mulch-free area, one to two inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay.

8. Follow-up care. Keep the soil moist but not soaked; over watering will cause leaves to turn yellow or fall off. Water trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less frequent watering.

Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting and wait to begin necessary corrective pruning until after a full season of growth in the new location.

After you've completed these eight simple steps, further routine care and favorable weather conditions will ensure that your new tree or shrub will grow and thrive. A valuable asset to any landscape, trees provide a long-lasting source of beauty and enjoyment for people of all ages. When questions arise about the care of your tree, be sure to consult your local ISA Certified Arborist, tree care or garden center professional for assistance.

The PHC Alternative

Maintaining mature landscapes is a complicated undertaking. You may wish to consider a professional Plant Health Care (PHC) maintenance program which is now available from many landscape care companies. Their program is designed to maintain plant vigor and should initially include inspections to detect and treat any existing problems which could be damaging or fatal. Thereafter, regular inspections and preventive maintenance will ensure plant health and beauty.

Plant Materials

Plant Selection

To choose the right tree or shrub, you must know your desires of the vegetation type, shape and role. Is flower, fruit, bark, or leaf interest your goal? Observing the site for sun, wind, and water conditions reveals what environmental tolerances your trees need. Check your soil. What is it like and what is its fertility? Until you consider all of your needs and site demands, it's tough to choose the appropriate trees.

The following checklist will help you guide your selection process.

Type of Tree or Shrub

- Broadleaf evergreen, like a rhododendron
- Deciduous, like a maple
- Needle-leafed evergreen, like a pine

Interesting Characteristics

- Flowering
- Fruiting
- Interesting leaf color or texture
- Interesting bark color or texture

Functions

- For accent
- for screening
- for shade

Plant Form

- Pyramidal or cone shaped
- Horizontal or wide spreading
- Round
- Upright or narrow
- Vase-shaped
- Weeping

Tolerances to environment or site include heat, cold, drought, wet or dry soils, pollution, sun, shade, wind, and salt spray to name a few. You must consider the conditions of each planting site in order to choose the appropriate tree or shrub for that location. The following can be used as a guideline for assessing the site conditions of a particular site.

Sun

- Sunny
- Shady
- Partial shade

Wind

- Open and windy
- Sheltered
- Totally enclosed

Soil Condition

- Sandy
- Clay
- Dry
- Well drained
- Silt
- Loam
- Moist
- Poorly drained

Other Site Factors

- Pollution (near busy street)
- Street tree
- Salt water spray
- Other special conditions

Plant Materials

Bare Root Tree Planting

What does that mean?

- Bare root trees are trees that are dug and stored without any soil around their roots.
- Trees can be bought “bare root,” and then planted directly into the ground.

What are the advantages of planting bare root trees?

- **More root mass.** Bare root trees can have up to 200% more roots than B&B or container trees, depending on the soil and transplanting history at the nursery.
- **Lower cost.** Without extra labor and materials, bare root trees cost seller and buyer less.
- **Easier planting.** A young tree without soil weighs little, so it is easy to move and plant.

There must be some disadvantages!

- **Less work time.** Once they leave the nursery, bare root trees need to get in the ground within a week at the longest. With no soil, the roots can dry out and die if left exposed for any time.
- **Narrower planting window.** Bare root trees need good soil moisture, so mid spring (before budbreak) and mid fall (after leaf fall) are the only two possible planting times.
- **Restricted availability.** Some species may not be available bare root, and some nurseries may not have trees available for bare root retail sale at all.

What are the best techniques to follow for such tree planting?

- Use any technique you can to reduce the time the tree roots are bare.
- Order 1.5-2” trees to be dug within 24 hrs of your arrival, otherwise be sure they are stored in a cool place.
- Have fall trees dug mid-Oct to late Nov, spring trees late Mar to early May.
- If possible, dip tree roots in a slurry of a *hydrogel* (a synthetic water-absorbing compound, many brands available) or muddy water, then store them in large, pleated plastic bags until planting.
- If no hydrogel is used, soak the tree roots in water for 12-24 hrs before planting.
- Keep trees covered, shaded, and moist until actually put in the ground.

Can all tree species be planted in this way?

- In theory, yes--but some species work better than others, and some commonly fail.

Best bets for bare root planting:

ash (*Fraxinus* spp.)
crabapples (*Malus* spp.)
English oak (*Quercus robur*)
hybrid Freeman maple (*Acer x fremanii*)
honeylocust (*Gleditsia triacanthos*)
Japanese tree lilac (*Syringa reticulata*)
linden (*Tilia* spp.)
Shantung maple (*Acer truncatum*)
sugar maple (*Acer saccharum*)
red oak (*Quercus rubra*)

Not recommended for bare root planting:

hawthorn (*Crataegus* spp.)
hornbeam (*Carpinus* spp.)
hackberry (*Celtis occidentalis*)
ginkgo (*Ginkgo biloba*)
shingle oak (*Quercus imbricaria*)
hophornbeam (*Ostrya virginiana*)



Checking depth on a bare root planting

Plant Materials

Buying Quality Community Trees

What does that mean?

- **Buying trees is like buying anything else:
write detailed specifications before seeking bids, and
check over the actual trees on delivery.**

Why is it important?

- **The first step in avoiding *future* hazard trees is to plant high quality stock.**
- Poor stock will end up costing you much more money in the long run because of:
increased rates of maintenance
shorter life span.
- The best insurance:
deal with a reputable vendor
establish careful specifications
reserve the right to reject upon delivery
get a two-year warranty if possible

But can't you save a lot of money by buying cheap trees?

- **If you have a knowledgeable and critical eye, it is possible to save money.**
- But trees are usually cheap for a reason:
they may be an undesirable species
they can have diseases
they often show poor structure
they may have dried out

What do you look for?

- **OVERALL**
health and vigor (at least 4-6" between the old bud scar and the end of the twig)
symmetrical general form, with a balance between height and spread
freshly-dug or containerized trees grown at least 2 years in a climate similar to yours
- **CROWN**
a single and undamaged central leader (except for certain ornamental trees)
well-spaced branches that are evenly distributed around the trunk
no branches below 48" from the ground (especially for street trees)
no branches with a narrow angle to the trunk (except for trees like Japanese zelkova)
no sign of insects or diseases (egg masses, leaf problems, etc.)
- **TRUNK**
a straight trunk, with no damage except minor scrapes and cuts
the caliper size you need (in an urban situation, at least 2" is often specified)
no recent pruning wounds, no topping
no signs of serious insects (e.g., borer holes) or disease (e.g., sunken areas, mushrooms)

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- ***ROOTS***

- a well developed root system, but not a dense mass from being pot-bound
- no girdling roots--make sure to look, or at least reach your hand down
- if balled and burlapped, only natural burlap or wire baskets
- a rootball appropriate for the height of the tree (see *American Standard for Nursery Stock*)

How can I be sure we plant high-quality trees?

- Deal with a reputable nursery
- Inspect all stock carefully
- Be sure all your specifications state: “All plants must conform to the current edition of the *American Standard for Nursery Stock ANSI Z60.1*”