

Planting the Landscape

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A landscape is an investment of time and money that can be a beautiful, functional, and satisfying living space. Gardeners and landscape managers implementing integrated pest management strategies through good judgment in plant selection, site preparation, and planting practices will reduce insect, disease, and wildlife damage and will help ensure the growth and longevity of the investment.

Site Preparation

Site preparation begins well before purchasing and planting. It includes marking utilities and landscape bed areas, removing unwanted vegetation, and creating a suitable growing environment. While these steps are similar for both renovating older landscapes and new construction, there are differences, depending on the situation.

- **Mark utilities and landscape areas.** Even the most carefully designed landscape documented in a detailed plan is likely to need adjustments in the field. Mark the locations of all landscape beds and individual specimens with flags or paint and adjust them for views, access by equipment, and practical uses (*Figure 1*). Remember to observe the layout from all angles and imagine the most complicated scenarios. Landscapes are three-dimensional; a tree that is well-located from one vantage point might appear to be in the center of a major window from another.



Figure 1. Mark all private utilities and lines prior to finalizing the locations of landscape beds and individual plants.

Plan for plant growth changes in size and shape over time, paying particular attention to the major structural elements — trees. Contact Diggers Hotline (www.ne1call.com/) before beginning the project. If extensive grading will be done, it may be necessary to reflag the actual landscape beds after the soil work is completed.

- **Remove existing plants.** Remove turf, weeds, and other undesirable vegetation from areas to be planted by either mechanical stripping or herbicide treatment. Small areas can be stripped using a flat tile spade or a machine such as an EdgeMaster™. The disadvantage of mechanical stripping is that roots of rhizomatous plants

will regenerate, and additional removal will be necessary. Herbicide control should be done following the directions on the label, paying special attention to application rates, number of applications, and the waiting period before replanting. The waiting period between spraying and planting will also vary with the herbicide, the plants being eliminated, and the weather (*Figure 2*). Solarization with clear plastic may also be used to remove unwanted vegetation.

- **Create a suitable growing environment.** When renovating older landscapes, trees and shrubs that are overgrown, in poor condition, of the wrong species, or in the wrong place for the new design

may need to be removed (*Figure 3*). Dig out as many roots as possible, and grind the stumps of trees, removing the chips. Failure to do this can cause settling and low spots, and may result in soilborne diseases.

Preparing Planting Beds

All landscapes benefit from proper bed preparation prior to planting. Whether installing a single tree, an entire mixed landscape, or a vegetable and flower garden, use equipment that will limit compaction and reduce negative impact on the planting area. The soil should never be worked or driven on when it is wet.

- **Grading.** The construction process used to build new homes is not kind to the health of plants that will remain or future plantings. The topsoil is typically stripped or buried. It may be stockpiled for later use but is often removed from the site entirely. The rough grading process used to establish the grades for streets and sewers involves very large equipment that compacts the soil. Construction materials may be dumped or poured onto the soil (*Figure 4*). Finish grading may be minimal, using a shallow tiller or box scraper, which does little to loosen the compacted soil. A small amount of topsoil may be placed over this base, leaving a hardpan or almost impermeable layer beneath the shallow topsoil.

Homes in older neighborhoods may have been built using less aggressive construction methods and smaller equipment (*Figure 5*). Over time, the buildup of organic matter may also have improved the planting conditions.

Poor drainage should be corrected prior to planting, whether it involves filling low spots, channeling water movement, or reducing severe slopes. Regrade to establish



Figure 2. Products containing glyphosate or 2,4-D or a combination are typically used to chemically clear a site. Be very cautious of herbicide drift that could damage other plants.



Figure 3. An older landscape with mature trees and shrubs presents different challenges for new planting.

positive drainage away from all structures for a distance of at least 10 feet using a 2 percent minimum slope. Slopes of less than 2 percent are difficult to grade and settling over time may create pockets or flat areas that will hold

water. Steep slopes can erode and may require retaining walls. It may be hard to hold the soil in place on a steep slope while plants become established.

- **Till the soil and add amendments.** The ideal process for



Figure 4. Plant roots may be unable to penetrate the barrier created by compacted soil, resulting in shallow surface roots and a reduced ability to survive drought.



Figure 5. Site preparation in older neighborhoods may be as simple as removing existing vegetation and tilling or raking lightly to reestablish good drainage.

modifying the planting areas in new construction sites is to chisel or till deeply. The addition of compost will benefit nearly all types of soil and improve planting areas (Figure 6). Generally, keep the proportion to 25 percent

compost and 75 percent soil. Otherwise, the site will settle too much when the compost breaks down.

Compost also is excellent top-dressing in landscape beds.

Amendment of individual planting holes is generally not recommended, due to the difference between the soil in the landscape and the soil in the container. Spread 6 inches of high quality topsoil mixed with compost and till again, incorporating the amendments with the construction soil. Do not attempt to till in sand to improve the drainage in a heavy soil. Rake the area to smooth furrow and remove large clods. Lightly water the planting area to settle the soil without re-compacting it.

Choose and Purchase Plants

Plants are available as bare root, in various containers, and balled and burlapped and spade-dug. The quality of plants is regulated by the American National Standards Institute (ANSI). Refer to American Standard for Nursery Stock. (http://americanhort.org/documents/nursery_stock_standards_AmericanHort_2004.pdf).

Reputable suppliers will not sell plants that are substandard and will stand behind their products with a warranty — usually one year from the date of purchase. Exceptions include plants that require specific care and are prone to loss, such as roses and butterfly bushes. These may be warrantied for a season or a certain number of days, as may perennials and ornamental grasses.

Purchase plants with healthy root systems. If the plants are in containers, pull them out to observe the presence of healthy white or light-colored roots and check for spiraling, girdling, or circling roots (Figure 7). Minor spiraling roots can be corrected at planting by scoring the sides and bottom of the root ball. A girdling root on one side of a tree can be corrected by cutting it.

If the container is so filled with roots that there is very little planting media left, the plant may become hydrophobic, repelling water. This

indicates the plant has been in the container for a long time. It is almost impossible to establish plants in this condition. Make sure plants have rooted throughout the media in the container in which they are planted. If the plants have recently been transplanted or replanted in a larger container, they may not have extended the roots into the larger container. Plants should be free of obvious defects, broken branches, damaged trunks or crowns, and insects and disease.

- **Bare root plants.** Bare root plants are available by mail order in early spring. They need to be kept protected and cool; the roots need to be kept moist; and they need to be planted while still dormant. This means the season for purchase and delivery is very short. Most suppliers of quality bare root plants, especially woody plants, will not ship them after a certain date or will require overnight delivery. Bare root plants are usually small, and may be purchased as rooted cuttings, transplants, or whips.
- **Container-grown plants.** Woody and herbaceous plants are readily available in containers of various sizes. Most are hard plastic with drainage holes, in colors ranging from white to black to pink or blue for special branding purposes (Figure 8). While these containers are easy to transport and can be held by the supplier for long periods of time, they can quickly produce poor root systems if the plants are kept in the same size container for too long. The most typical issue is circling or girdling roots. It is also common to find plants that are too deep in their containers, with the root systems well below the surface of the soil.

Containers that promote healthy root development from the time a tree or shrub is seeded are becoming more widely available (Figure 9). Plants grown in these containers, which are made of fabric-based materials that allow



Figure 6. The amount of compost to mix with topsoil in a new landscape will depend on the original soil type and the type of plants that will be used in the bed. Most use too little compost to modify a soil.



Figure 7. If the entire trunk is encircled by a girdling root, reject the plant.



Figure 8. Plants can be purchased in various types of containers.

Planting Seasons



Figure 9. RootTrapper® is an example of a container that develops healthy roots.

With the advent of container production, plants are now available from very early spring through late fall, allowing them to be installed anytime when the ground is not frozen. However, plants will establish more quickly if they are planted or moved when they are dormant and when environmental conditions are neither too hot nor abruptly frozen.

The spring planting season can begin as soon as the ground is thawed and dry enough to avoid damage to the soil. Planting can occur into June, but plants installed in late June or July may suffer from heat and dry conditions.

Fall is an excellent time to plant many — but not all — woody plants. Cooler temperatures, shorter days, and the return of precipitation all contribute to successful establishment. Although the fall season can extend until the ground freezes, plants installed that late risk damage. This is especially true if the ground freezes before the roots have had a chance to penetrate the surrounding soil and if adequate moisture isn't provided during warmer winter days.

- **Hardy plants.** For the vast majority of hardy plants, conservative limits for spring planting are March to June. The fall season for planting deciduous woody plants is from late August into November. Plants that are on the edge of their hardiness zone, or are being installed in less than ideal locations, should not be planted in the fall. Bigleaf hydrangeas, Japanese maples, and redbuds are a few of the plants that do best when spring-planted. Broadleaf evergreens (hollies, boxwood, rhododendrons, mahonia) can suffer from wind damage and desiccation. They are best planted only in spring.



Figure 10. B and B trees may be in wire baskets. Twine and treated burlap will not deteriorate and should be removed.

the exchange of air, have dense, fibrous root systems. However, plants can still develop root problems if left too long in these containers.

- **Balled and burlapped plants.** Balled and burlapped (B and B) trees and shrubs present a different set of challenges. Plants sold this way are usually larger than those in containers. The ball may be very heavy, and it may be difficult to see the quality of the root system if the burlap is well-pinned (Figure 10). Peel it back from the

trunk to look at the trunk-to-soil relationship and to make sure old twine isn't embedded in the trunk.

- **Tree spade.** Mechanical spade planting is usually reserved for larger trees. Confirm that there is a clear access route for the truck or trailer, including clearance under wires and streetlights. The size and type of the spade can vary from 18 inches to over 100 inches in diameter. The plug must be pulled first, and the tree is then dug and moved into position over the hole.

- **Roses and suffrutescent plants.**

Roses, including shrub roses, and suffrutescent plants (plants with a woody base that don't die down each year) are also best installed in the spring (*Figure 11*). Because the caudex (crown) is woody and reliably perennial but the top is not, the stems or canes of these plants die back, at least part way, every year. They can become dry and cracked, allowing moisture to enter and crack the root system. This is particularly prevalent with fall-planted plants.

- **Evergreens.** The ideal planting window for evergreens differs from that of deciduous plants. Because needled evergreens continue transpiration during the winter months, they need to have good root-to-soil contact before the ground freezes. To avoid possible damage, install evergreens between mid-August and mid-October. They can also be successfully planted in spring.

- **Perennials.** Perennials may be available as bare root plants through mail order nurseries all season, but bare root plants should be installed only in spring. Perennials in containers can be planted in spring or fall. However, since their root systems are smaller than those of woody plants, and because the crowns may heave out of the ground, it is important to plant by mid-September to allow the roots to penetrate the surrounding soil before winter dormancy.

No matter how carefully a plant is handled, it will be somewhat stressed during the transition from its container to its permanent home. Planting in the early evening gives plants cool, dark conditions to recover, as does planting on a cloudy day. Avoid the heat of the day, especially if it is windy.



Figure 11. Butterfly bush, blue mist spirea, some hypericums, some hydrangeas, Russian sage, and beautyberry are considered suffrutescent plants.

Space and Place the Plants

It is easy to place plants too close to one another or too close to the house, fence, or sidewalk. They may look small when placed and the container or root ball may be as large as the plant itself, but plan for the mature spread of the plants. Leave enough

room to comfortably reach windows; keep sidewalks and driveways clear; and allow adequate distance from the house to prevent future animal entry opportunities. A good rule of thumb is to stand next to the wall or edge of the house, take a large step away, and mark that location as the outer spread of the plant at maturity, rather than the location of the center of the planting hole.



Figure 12. A plant that is buried deeply in the container can be further stressed by planting it too low.

An industry-wide issue is that the root systems of balled and burlapped or container-grown plants may be buried deeply during the production process (*Figure 12*). Planting them too deep adds to this problem. Find the top or primary lateral roots of trees and shrubs to determine the depth of a planting hole. Lateral roots should be just below the final surface of the soil (*Figure 13*). Dig the holes before removing the plants from their containers. The hole should be twice as wide as the actual root system and at the same depth or slightly shallower. In extreme situations, dig a trench extending from the bottom of the hole into the landscape. Fill the trench with gravel to form a reservoir away from the roots for excess water.



Figure 13. The primary lateral roots determine the correct planting depth. Lateral roots should be just below the final surface of the soil.

Unless it is contaminated, the soil removed from the hole should be used for backfill. The media in which the plant was grown is likely to be of a looser and more porous composition than the landscape area. Amending the soil in the planting holes can allow plants to grow well and rapidly until they reach the sides of the hole, but can act like a semisolid barrier to further growth. Scarify or slice the soil around the sides and bottom of the hole, especially if it is clay. This will reduce the possibility of glazed sides and help the new roots penetrate the surrounding soil.

When installing new plants, special care should be taken to minimize damage to the roots of existing trees and shrubs that will remain in the finished landscape. If possible, place understory plants at the drip line of existing trees. When planting under the canopy, choose plants that are available in small sizes or plants that can reseed or spread by rhizomes or stolons. Be prepared to adjust the planting locations to avoid damage to major roots and dig carefully by hand. New plants will need special attention in these conditions because the established plants will outcompete

Dig the Holes

The planting site and plants should be well-watered but not soggy before installation begins. If the soil in the planting areas is adequate to support plant health, it is possible to avoid tilling an entire landscape bed. This method may help minimize damage

when planting around existing trees. Use smaller plants, and place them at or near the dripline, if possible. Spray the bed with glyphosate, dig the holes for the individual plants, and simply mulch over the open areas between plants. In heavy, over-irrigated soils, more plants die from drowning than from drought.

new small plants for sun, water, and nutrients. The site under a canopy can also be very dry, even if the surrounding landscape receives water. Specific guidelines for transplanting plants include:

- **Bare root plants.** Remove bare root plants from the packaging material and check for healthy roots. Soak the roots for up to 24 hours in water to rehydrate them. If they cannot be planted immediately, rewrap the roots in excelsior or shredded paper that has been moistened and store them in a cool, shaded location. Check frequently for signs of mold or desiccation, and wet the packing material if necessary. Identify the crown of the plant. Prune any broken or damaged roots or branch tips. Place the plants on a cone of soil in the center of the hole, fanning the roots out around the center. Backfill until the hole is 2/3 full. Water lightly to settle the soil and remove air pockets. Continue backfilling, creating a saucer around the plant.

- **Container plants.** To plant trees and shrubs purchased in plastic containers, pull the plant out of the container and observe the root system. If the root system is well-developed but circling slightly, gently untangle the roots and spread them out (*Figure 14*). If the root system is dense, loosen it by either slicing through the outer edges of the root ball in four locations from top to bottom and making an X in the bottom, or use two tined forks to tease the roots apart.

Place the plant in the prepared hole, checking to adjust the depth. The crown or trunk of the plant should be slightly above the surrounding grade. Backfill with soil from the hole, working it into the spaces around the roots with a spade (*Figure 15*). Water to remove air pockets and continue adding soil to the right planting depth.



Figure 14. The roots of this container-grown tree have been exposed, showing the actual size of the ball in comparison to the container and the tangled roots. Roots can be teased apart in some cases.



Figure 15. Use soil from the planting hole as backfill around plants.

Plants grown in root-producing containers should be removed from the fabric by sliding a soil knife or sharp spade between the fabric and the growing media and slicing through the roots. Roll the fabric down to remove it. Tease the outer roots apart if necessary. Planting then follows the same process as that used for container-grown plants.

- **Balled and burlapped plants.** Check the depth of the planting hole in comparison to the top of the ball and the first lateral root. It will be difficult to get a tree back out of a hole if it is too deep. Scarify or slice the sides of both the ball and the planting hole. Remove all twine and burlap once the plant is positioned in the hole. Research regarding the long-term



Figure 16. A correctly staked tree will establish a strong root connection with the surrounding soil.

effect of wire baskets on tree root growth is inconclusive. However, removing as much of the wire as possible, or at least clipping it, will eliminate a foreign object in the path of root development. Backfill with soil from the hole, and water to eliminate air pockets before completing the planting.

- **Tree spade plants.** Trees planted with a mechanical spade are often too deep because it is difficult to get the spade into the soil at exactly the same depth when pulling the plug and pulling the tree. Scarify the sides of the hole to reduce the glazing effect, and add fill to compensate for deep spade-dug holes. If possible, orient the

tree in the same direction in which it grew in the nursery to reduce the possibility of frost cracking or sunscald. It is usually necessary to have excess soil available to backfill the space between the spade ball and the surrounding soil.

A common mistake when planting, either by hand or by tree spade, is to compact the soil too much by aggressive tamping. The best way to eliminate large air pockets and settle the soil is to lightly water each layer of backfill.

Water

When finished planting, water thoroughly before applying mulch. Unless the landscape is zoned separately for watering the turf and landscape plants, it will be difficult to apply the correct amount of water at the right time for newly installed plants using only an automatic irrigation system.

The amount of water required will depend on the composition of the root ball and the surrounding soil, and environmental conditions. Some plants may need water two to three times per week. Others will thrive on 1 inch every week to 10 days. A slow, deep watering will produce better roots than frequent light sprinkles. Observe the condition of the plant and use a screwdriver to check the soil moisture. If it can easily be pushed into the ball, no water is required.

Stake, Protect, and Mulch

Trees may need to be staked until they have rooted into the surrounding soil. The purpose of staking is to hold the root ball in the ground, not to keep the top from moving (*Figure 16*). A wooden stake driven into the ground at a 45-degree angle and attached loosely to the trunk with a figure eight of a flexible material is an ideal staking method. Cage or wrap trees and shrubs that may be susceptible to mechanical

or animal damage. Refer to EC1276, *Protecting Landscape Plants*. Almost all plants benefit from being mulched — even those that are extremely drought tolerant. Refer to EC1274, *Mulching the Landscape*.

Usually, fertilizing trees and shrubs when they are planted is not necessary. Pruning is also unnecessary unless there are broken branches or roots. Plants need all their foliage to photosynthesize and recover from the shock of transplanting.

Monitor newly installed plants carefully during the first growing season. The root ball may dry out quickly, even if the surrounding soil is moist. Container plants can dry out in a single hot, windy day. Insects, animals, and diseases may weaken newly installed plants because they are under stress. Plants can also settle, causing excess water to pool.

Summary

Proper plant selection, site preparation, and planting practices are aspects of integrated pest management. Continued integration of correct cultural practices is important through proper mulching, watering, fertilizing, and other management practices to reduce pests. See EC1266, *Integrated Pest Management for Landscapes* for further information.

This publication has been peer reviewed.

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