

CHAPTER 13

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CHAPTER 13

Woody Landscape Plants

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Woody ornamental plants are key components in a well-designed, useful environment. This large group of plants can be divided into three general categories: trees, shrubs, and vines.

Trees are woody plants that produce one main trunk and a more or less distinct and elevated head (height of 15 feet or more).

Shrubs are woody plants that usually produce multiple shoots or stems with a height of 15 feet or less.

Vines are climbing or crawling woody plants without self-supporting upright stems.

Ground covers are low-growing plants that create an attractive carpet effect.

This chapter will include considerations in selecting plants based on: function, soils characteristics, and climatic factors. Planting, fertilizing, mulching, and other cultural practices are discussed.

Vines in the Landscape

Most vines are woody or semiwoody climbing or trailing plants. Like shrubs, trees, and ground covers, vines can be important to the interest of any garden landscape. Each species and variety of vine possesses distinctive characteristics which make it well-adapted to certain locations in the landscape plan.

Selection

In selecting vines, as in selecting trees and shrubs, carefully review the needs of the area, and then select the most suitable plants. Vines can be useful in a variety of sites. Some vines are valued for the shade they provide when trained over an arbor. Others add interest to a planting when trained against the wall of a building or when used to frame a doorway. Some vines can be used to relieve the monotony of a large expanse of wall, being trained in a definite pattern or allowed to completely cover a wall with leafy green, while others dramatically change a plain fence. Vines can be useful to form a cascade of bloom on rough, steep banks while holding the soil in place.

Vines also offer diverse visual qualities and are valued for the rich texture of their foliage, their decorative habit of growth, the fragrance of their blooms, or the beauty of their flowers. Some are valued for the graceful tracery of their simple stems or for the beauty of their leaf pattern. Vines offer a rich source of material with which to create interesting, exciting, and beautiful plantings.

Vines are generally divided into three general groups based on their method of climbing:

- (1) Some, like Boston ivy, climb by attaching small, root-like appendages to the wall as a means of support. Sometimes these are modified tendrils with small, circular discs at the tips; others, like English ivy, have small rootlets along the stem to firmly attach the vine to either brick or wood.
- (2) Vines such as clematis and grape climb by winding tendrils (or leaflike appendages which act as tendrils) around the object on which they are growing.
- (3) The third group, including bittersweet and wisteria, climb by twining. It is interesting to note that all vines do not twine in the same

direction. There is not a haphazard method of twining. The plants of each species invariably twine in one direction. As example, bittersweet twines by climbing from left to right. Hall's honeysuckle twines by climbing from right to left.

By knowing in advance how each vine climbs, the proper means of support can be provided for those selected.

Culture

Most vines will quickly revert to a tangled mass of foliage over the ground if they are not given the proper means of support and a reasonable amount of care and maintenance. The best type of support for vines gives the required structural strength and stability, and at the same time, is neat in appearance.

Like most other plants, vines require some maintenance. Pruning is necessary to remove old wood. This may require several cuts to each stem so they can be untangled. It is often necessary to prune occasionally to keep the plant within bounds and to guide future growth. As with other plants, vines are pruned to produce better bloom. Insect and disease control is important. Watch for signs of pests, identify the cause of the problem and use appropriate control measures. Your local Extension office can help you with this process.

The area to be covered should be studied carefully to determine what type of vine should be used. Rate of growth is a critical consideration, since there are vines that exhibit rampant growth and can soon become a nuisance.

Ground Covers in the Landscape

In a broad sense, ground covers include any material that covers the ground surface so that it cannot be seen from above and so that rain does not strike directly upon it. With this definition, grass, various types of paving, shrubs, and even trees could be called ground covers. However, here we are referring to ground covers as low (up to 18 inches), mat-forming or trailing plants, other than grasses or other plants that tolerate walking or mowing. Most ground covers are not intended to be walked upon and will be severely damaged by pedestrian traffic. When ground covers are chosen carefully and placed correctly, they greatly enhance the beauty of the landscape composition. In addition to their aesthetic value, they fulfill a number of other

important functions:

- Controlling erosion on slopes
- Obstructing traffic without impeding view
- Conserving soil moisture and, during periods of extreme heat, lowering temperatures in the soil
- Reducing lawn maintenance
- Filling narrow, odd-shaped areas where mowing and edging might be difficult
- Providing vegetative growth where grass is difficult to maintain
- Producing interesting patterns with variation in height, texture, and color
- Trees and shrubs are visually tied together in beds when interplanted with ground covers.

In practice, the ground covers most frequently used are plants that are easily propagated, vigorous, and hardy.

Selection

Selection of a ground cover will depend upon several factors. Is the area flat or sloping? Is it in sun, or partially or deeply shaded? Soil conditions must be studied. Some ground covers prefer a moist soil, rich in organic matter while others will adapt to dry, sandy situations. Give consideration to color, texture, height, and habit as well, since some ground covers tend to grow rampantly. One problem that limits the use of ground covers is the cost of installation since large numbers of small, individual plants are required. In addition, a well-prepared planting bed is essential to the establishment of ground covers and can be costly and time-consuming. Hardiness is also a factor, especially if the ground is bare during winter months.

Culture

Significant maintenance is necessary for the first 1 to 3 years or until the ground cover becomes established. Cultivation is necessary to control weeds; fertilization to encourage fast, vigorous growth to achieve good cover; irrigation in times of dryness; and disease and pest control. When these maintenance considerations are ignored, the progress toward achieving a good ground cover planting is disappointing.

Wherever paving, lawn, or cultivated beds are not desirable, ground covers can be successfully used. Newly cut banks, and any slopes greater than 12% are best treated with ground cover plantings. Around buildings, ground covers are superior to paving or structural controls for reducing heat, glare, noise, and dust.

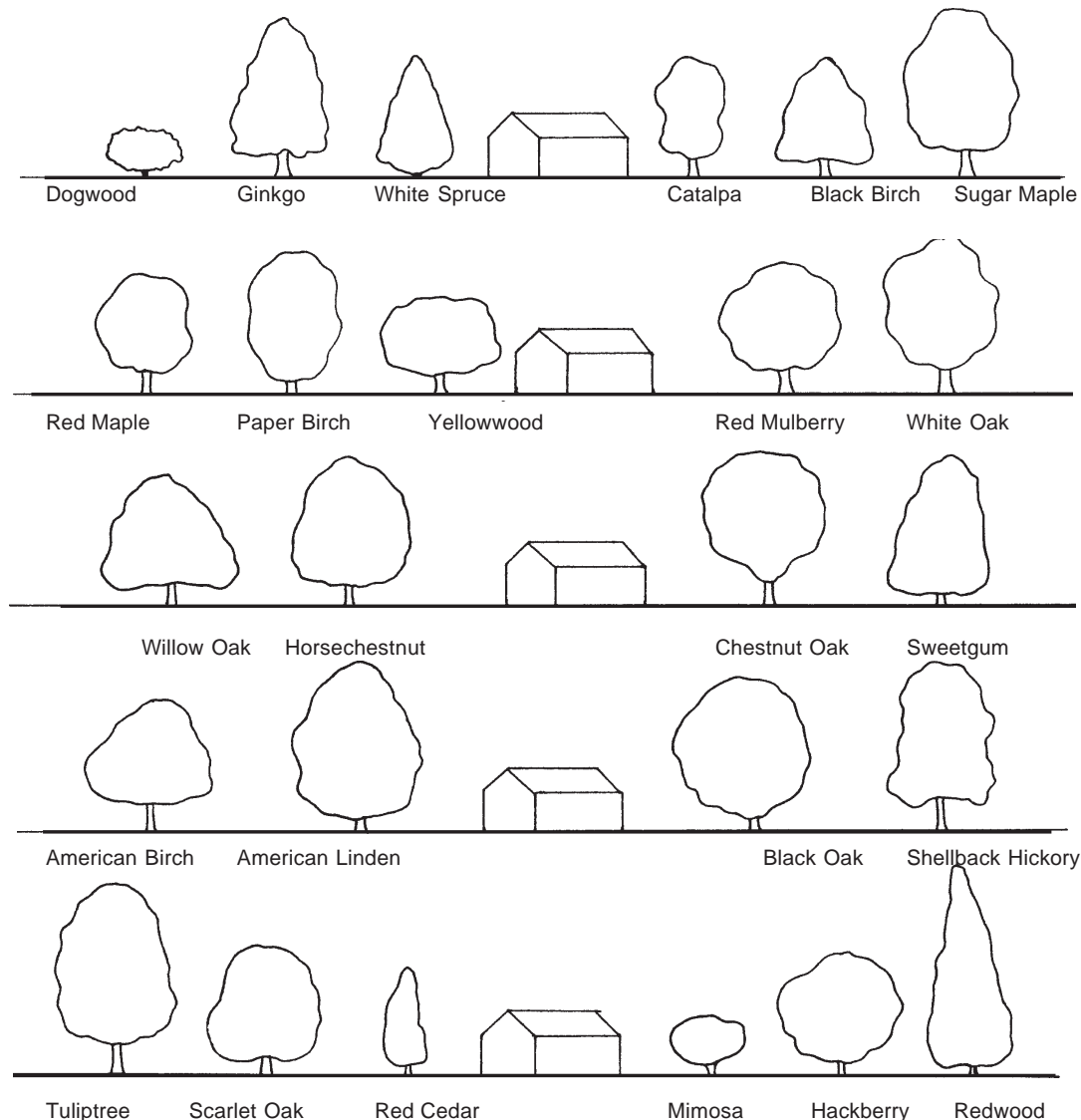
Selecting Trees and Shrubs

Because there are so many woody plants available for use in landscaping, we must be careful to select plants that are appropriate for our needs. Selection should be based on several different factors.

The intended purpose should influence selection of plants with appropriate shape, size, and other physical characteristics. Trees are used for shade, ornamental, screening, windbreak, and sound-reducing purposes. Shrubs are used for screens, barriers, windbreaks, ornamentals, ground covers and wildlife shelters. Both trees and shrubs can be selected to provide edible fruit or nuts.

Providing shade usually requires tall, sturdy, long-living species. Density of foliage, which determines the amount of shading, is important. A tree such as a Norway maple will produce a very dense shade that prevents plants or turfgrass from growing under it, while a honey locust will produce a light partial shade which is not a hindrance to other plants growing below it. Deciduous trees should be used to shade the south windows of a home in the summer, thus allowing the sun to penetrate in the winter. Screens usually require plants that produce a dense foliage. Windbreaks must be able to survive rigorous climate conditions. Evergreen plants are usually chosen for screening. Barrier plantings usually require sturdy plants with dense growth, and possibly thorns or spines.

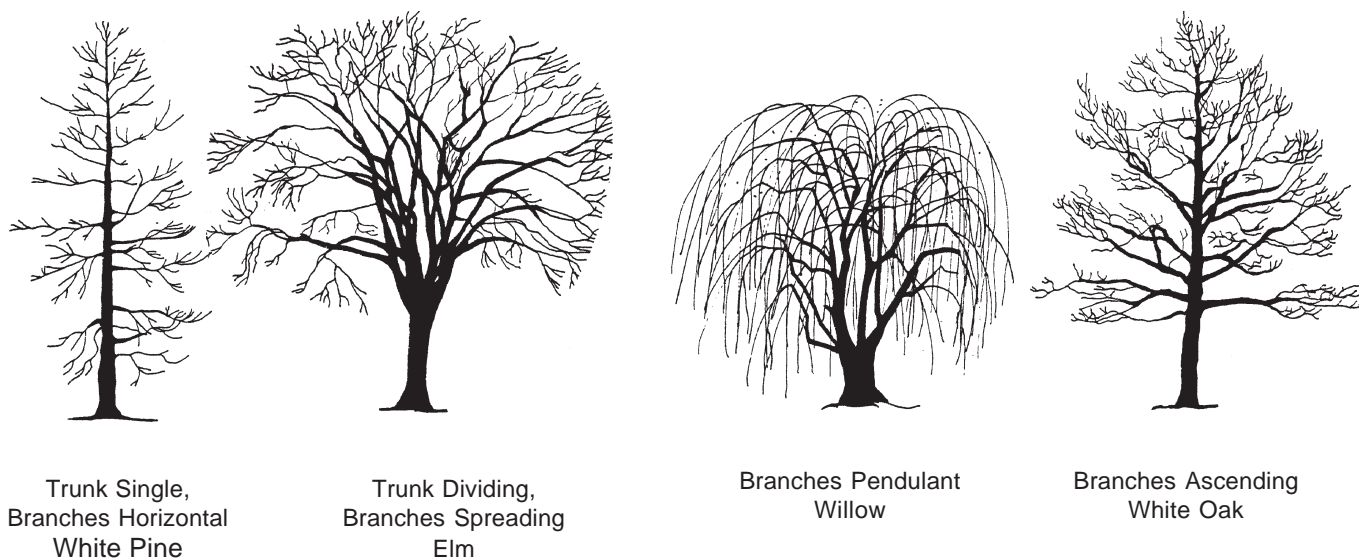
Size of mature shade trees in relation to the height of a two story house.



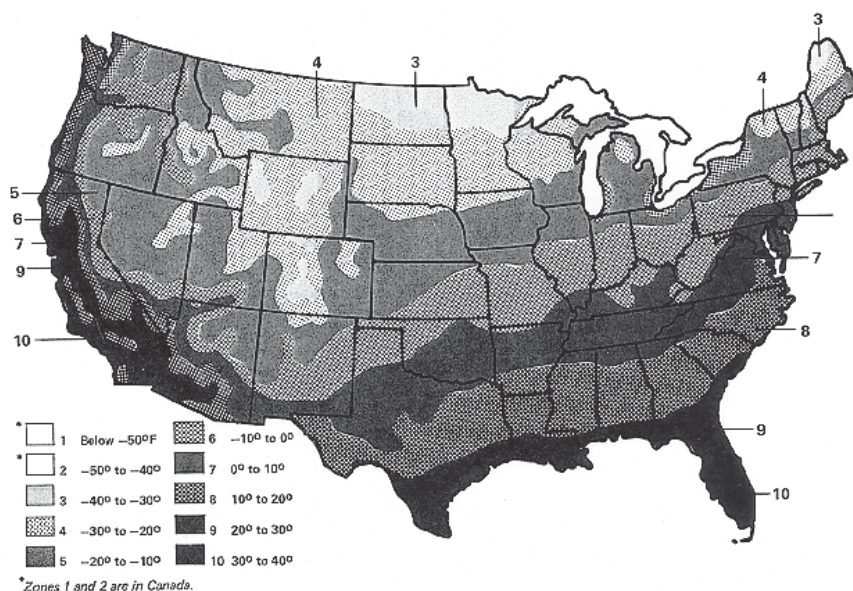
Ornamental attributes are quite varied. Both trees and shrubs can be selected for flowers or colorful fruit, interesting foliage, fall color, interesting bark, winter colors of foliage or branches, or interesting shapes of the plants themselves.

Consider the size of mature trees and shrubs and where they are to be used. Trees that grow tall, such as the white oak, sugar maple and white ash, are suitable for larger buildings. They tend to dominate or hide one-story buildings. For attractive and proper balance with one-story buildings, trees that do not grow over about 35 feet are recommended. Shrubs that outgrow their spaces can hide windows, block walkways, or crowd out other plants. Shrubs can sometimes be kept small by pruning, but this requires continuing maintenance. Careful consideration of mature sizes will reduce the need for pruning.

Shape is especially important in selecting trees for ornamental and shade purposes. Tall trees with long, spreading or weeping branches give abundant shade. Small trees and trees of other shapes, including the pyramidal evergreens, the clump birch and the low growing hawthorn, crab apple, and dogwood are useful for ornamental purposes but do not give abundant shade.



Environmental conditions should influence the selection of plants. Size of the planting area is important, as are site characteristics such as sunny or shaded, wet or dry, exposed to winter winds or pollution. Plants selected should be tolerant of existing conditions, and be hardy in the appropriate climate zone.



Finally, consider how much maintenance the plant will require and any possible disadvantages including susceptibility to attack by diseases and insect pests; soft or brittle wood that is easily damaged by wind and ice; fruits and seeds that are large, messy, smelly, or otherwise obnoxious; and abundant shedding of twigs and small branches. Some examples of these conditions are killing of Lombardy poplar by *Cytospora* canker or by borers, breaking of Siberian elm branches by wind and ice, and the production of bad-smelling fruit by the female ginkgo. The production of fruit by the mulberry, which attracts birds, can also be an undesirable characteristic. Since this fruit is soft and decomposes rapidly when ripe, it is messy on walks and attracts flies and other insects.

Purchasing Trees and Shrubs

Once the selection process is completed, plants can be purchased. Transplants can be classified into three classes according to the way they are dug and/or shipped: bare-rooted plants, balled and burlapped plants (B&B), and container-grown plants.

Bare-Rooted Plants

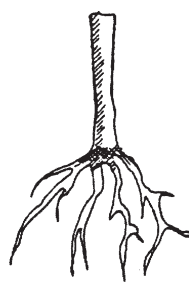
These have had the soil washed or shaken from their roots after digging. Nearly all are deciduous trees or shrubs which are dormant. Most mail-order plants are of this class because plants in soil are too heavy to ship economically. Many tap-rooted plants, such as nut trees and some fruit and shade trees, are handled this way because they are not amenable to balling and burlapping. Plants available from mail-order nurseries in early spring with roots wrapped in damp sphagnum and packaged in cardboard or plastic containers are also bare-rooted plants. These need special attention because their roots are tightly bunched up in unnatural positions in order to force them into the package. Remove the sphagnum packing and be sure to spread the roots out to a natural position.

Evaluate the plant material at time of purchase.

- Ball size in relation to tree caliper or shrub size
- Leaf size
- Branch structure
- General health - growth rate, stressed plants and damage from insects, etc. are unacceptable

Plants in the bare-root class are best planted while they are dormant, in spring. Never let the roots dry out. This is perhaps the single greatest reason for failure with bare-rooted plants. Keep roots in water or wrapped in plastic or wet paper until you are ready to place the plant in the hole, and plant as soon after obtaining them as possible. This class of plants may need extra pruning at planting time.

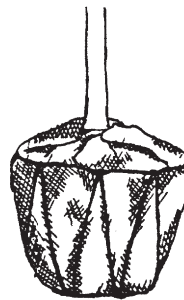
Bare Root



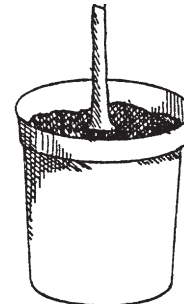
a. bare root



b. pre-packaged



c. Balled and burlapped



d. Potted and container grown

Balled and Burlapped Plants

These are likely to have been grown in nursery rows for some time and to have been root-pruned so that the root system within the balls is compact and fibrous. Such plants re-establish themselves rapidly. This method is primarily used for plants that never lose their foliage and thus are not amenable to bare-root treatment. Such plants are broadleaf evergreens like rhododendrons and azaleas, and conifers of all types. A number of deciduous trees and shrubs that have branching root systems which are easily contained in a soil ball are also sold as B&B plants.

Plants in this class are best planted in early spring prior to bud break. This will allow roots to take advantage of growth hormones produced in shoot tips.

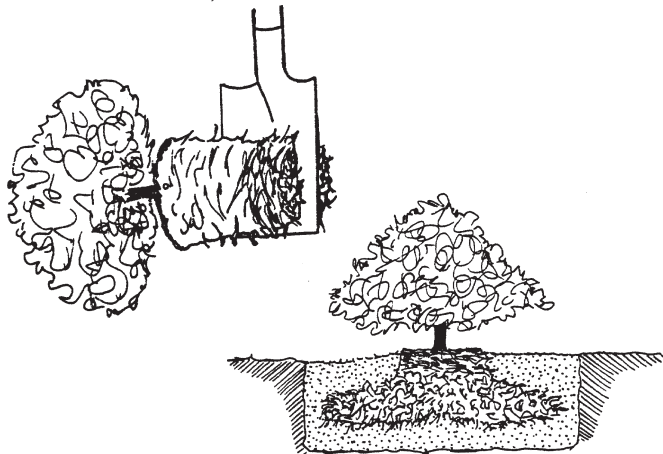
When selecting a balled and burlapped plant, be sure the ball is sound and hasn't been broken. Avoid those plants that feel loose in the soil balls. Be sure the soil ball does not dry out. These plants will usually need little if any pruning at planting.

Container-Grown Plants

These are usually grown in the container in which they are sold and are increasing in popularity in the nursery trade. Because of their appearance, gardeners are often misled into thinking that all they have to do is put these plants into the ground and forget about them, but they need the same careful planting and maintenance as other plants -- proper watering is critical. Container-grown plants can be planted any time during the growing season but prior to October 1st. Roots must grow out one-half inch before water absorption occurs through root tips.

Container-grown plants can easily become pot-bound. Their roots are contained in a limited space and coiled around one another in the container, and may fill it tightly. Some of the larger roots may have become coiled back around the trunk and begun a process called girdling.

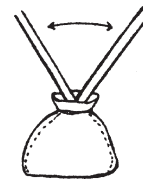
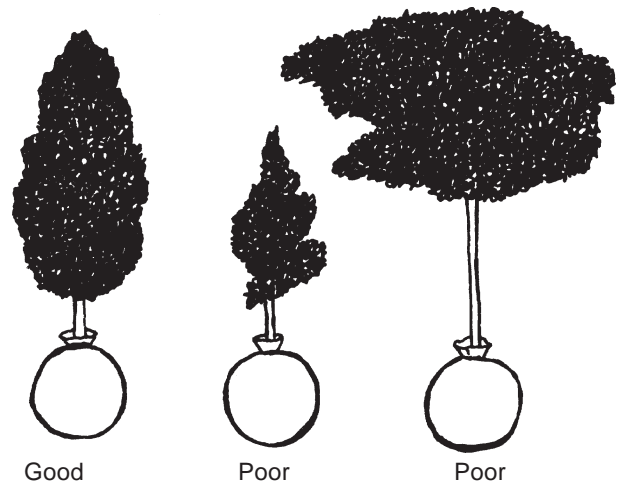
The solution to this problem is to split the lower half of the root system and spread the roots horizontally. This practice will prune the roots, thus encouraging new laterals, prevent girdling roots and raise the lower roots closer to the soil surface. An alternative is to cut vertical slits around the root ball, in 4 to 5 evenly spaced places. If any roots are girdling the base of the stem, sever them.



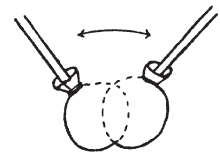
When selecting plants, look for a good natural shape, free from thin spots or broken limbs. Make sure the root ball is solid and the bark is intact. Avoid container-grown plants where you can see roots circling on the surface or coming out of the drainage holes. Plants chosen should be free of any insects or diseases. Generally, the smaller sizes of a

plant will cost less, and may establish faster. Don't buy plants so small they are in danger of being walked on or mowed over.

Proportion of Roots to Top

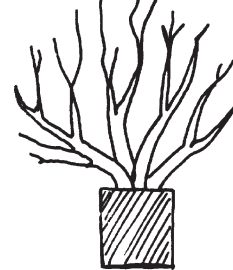


Loose root ball is unacceptable.

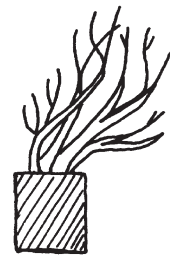


Root ball of acceptable B&B plant stays firm when rocked gently.

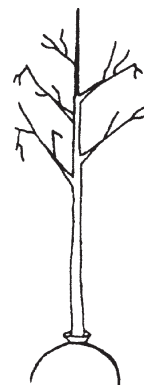
Shrub Symmetry



Good



Poor

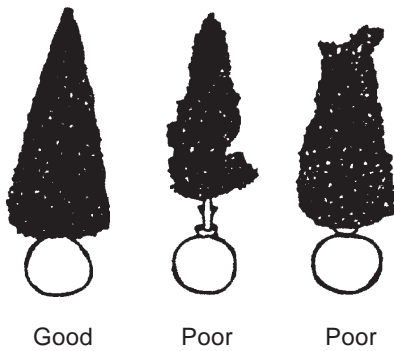


Broken twigs are acceptable.



Broken branches, gouged trunks are unacceptable.

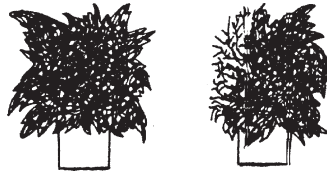
Evergreen Silhouettes



Good

Poor

Poor



Vigorous,
bushy conifer

Poor conifer

Apparently, the addition of organic matter into the backfill soil creates an interface between the amended soil and the undisturbed soil around the planting hole that is detrimental to root growth and water movement between the two soils. In tests conducted at the University of Georgia, examination of the root systems of plants in holes with amended soil revealed that the majority of the roots were confined to the original planting hole.

A better approach is to select a plant appropriate to the soil type or to replace or amend a poor soil with a better loam.

The finished planting depth after settling of the soil should be such that the plant is exactly the same depth after replanting as when growing in the nursery. Probably more plants are lost because they were planted too deep than for any other reason. Set the plant on firm native soil in the bottom of the hole. When planting a poorly drained site, set the plant so that 1 to 2 inches of the root ball are above the soil level.

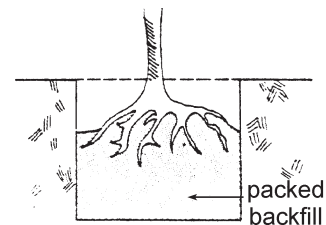
Planting Trees and Shrubs

The proper installation of plants in the landscape involves much more than just digging holes and setting plants in them. The planter is responsible, as far as possible, for developing a satisfactory microclimate for optimum growth and development of the plant. A healthy and vigorous plant is required if the landscape is to achieve the desired effect. Healthy plants will need less maintenance in the years following establishment.

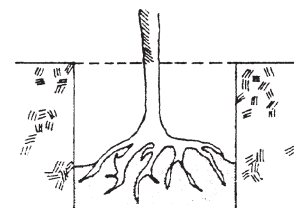
The planting hole is important since this is the environment of the plant root system. Dig a wide hole, twice as wide as the root ball if possible, and only as deep as the root ball. For very large specimens, such as trees of 4-inch caliper or more (the term caliper is derived from the use of a caliper to measure the trunk diameter) and large shrubs with a soil ball of 3 feet or more, the hole should be made up to 24 inches wider.

A traditional recommendation for preparing a planting hole for trees and shrubs has been to incorporate organic matter into the backfill soil. Recent research has cast doubt on the value of this practice. In fact, it appears that energy could be better spent digging a slightly wider hole than working organic matter into the soil.

Proper Planting Depth



correct



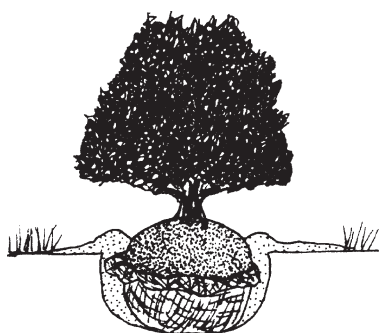
incorrect

Balled and burlapped material must be handled carefully. On most species if the soil ball is broken, many of the roots will be severed from the trunk and the plant will die. Always pick the plant up by the soil ball or container, never by the trunk or stem. Set the B&B plant into the hole, remove all ropes, and fold the burlap down into the bottom of the hole. Cut away and discard the burlap if possible, especially if it is actually plastic. Remove all plastic or metal containers before placing a containerized plant in the hole. Small containers with tapered

sides can be removed by turning the plant upside down and giving the top edge of the container a sharp rap. Catch the soil ball with your hands as it slips from the container. Do not break the soil ball apart. The larger-sized containers (five gallons or more) should be cut away with special cutters. If the trees' balls are in wire baskets, they also should be cut away. If plants have become overgrown in the container and the root mass is growing in a tight, compact circle around the soil ball, cut out the outer roots with a sharp knife in two or four places around the soil ball. Make the cut from the top to the bottom of the soil ball.

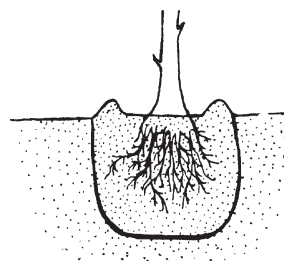
Bare-root plants should have the packing material and all damaged or dead roots removed. If possible, before planting, the roots should be soaked in water for at least an hour but not longer than 12 hours. Do not allow roots to be exposed to sunlight or dry out before planting. It is best to keep bare roots covered with moist burlap or some reasonable substitute until planting time. When planting into drought prone soils consider soaking the roots in an aqua gel just prior to planting.

After the B&B or container-grown plant has been placed in the hole, fill in around the plant with the backfill until the hole is 2/3 full. With bare-root plants, the soil should be worked gently in and around the roots while the plant is being supported. The most satisfactory way of removing air pockets is to fill the hole with water and firm the soil around the plant ball or roots. However, be sure not to use excessive force, since soil compaction should be avoided.



Before finishing the filling process, make certain the plant is straight and at the proper depth, then complete the filling process with the backfill. If the specimen is an individual, construct a ring of earth 2 to 3 inches high at the edge of the outside diameter of the hole to form a water basin. Plants in beds probably will not require a water basin. Water the

plant thoroughly as soon as the water basin is constructed. Fill in the basin prior to winter to reduce the possibility of freezing/thawing and heaving. Organic mulches such as pine needles, bark, and wood chips provide the best environment for future root development, and are applied in November. Pull the mulch back about 6" around the base of the plant.



Soil depression retains water

Note that a complete fertilizer is not added to the backfill. Newly developing roots can be damaged by too much fertilizer. Limestone or super phosphate can be incorporated into the soil if a soil test indicates a need. Large areas should already have an established fertility level based on recommendations from soil test results before the planting of individual plants takes place. A fertility program may be delayed until the spring of the following year to provide needed nitrogen and potassium or a slow-release fertilizer, such as 18-6-12, can be applied 4 weeks after planting at a rate of 2 oz. per 4 sq. ft. area.

Transplanting Native Trees

Many homeowners who transplant native plants from the woods are often disappointed because the plants die. Nursery trees are root pruned a year or more before transplanting is to occur, which results in a compact root system. This allows more of the roots to be dug up when transplanting.

For success in transplanting native plants, it is important to understand the environment in which they are growing naturally. Duplicating this environment on the new planting site is the key to the plant's survival. Some environmental factors to consider include light, soil moisture, and soil acidity. Most of our native soils are slightly acid, so you may have to adjust the soil pH in the new location. This can be determined by having the soil

tested at your local Extension Office well in advance of anticipated transplanting. Soil moisture can vary within the distance of a few feet. Plants growing naturally on a slope probably require good drainage, while those growing in bogs require wet conditions. Similarly, if the soil is sandy, the plant will transplant best into sandy soil. A plant growing on the edge of the woods generally requires more light than one in a thick forest. These environmental conditions must be similar at the new location.

The following planting conditions will increase the chance of survival:

- Smaller plants transplant more successfully than mature specimens. A six-inch tall plant may be moved when dormant and bare rooted.
- Root prune by cutting around the circumference of the root area in the Spring; one year prior to the planting date. A sharp nursery spade should be used for best results. On the planting date, re-cut the ball, dig a trench on the outside of the circumference, under-cut the ball, and finally remove the plant.
- Dig a hole no deeper and 12 inches wider than the root system. Refill with a mixture of enough existing and native soil of the plant to accommodate the root ball or bare-root system. Avoid planting too deep.
- Firm the soil and water thoroughly.
- Mulch with approximately 2 inches of decayed sawdust, leaf mold, or other available materials in November.
- Fertilize only with superphosphate.

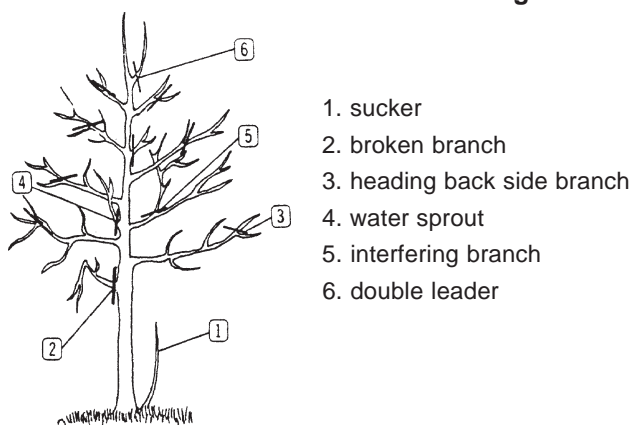
Adequate soil moisture is critical for several months after transplanting. Water only when necessary. Over watering will result in sure death. To determine if the soil is dry, stick your finger 1 to 2 inches below soil surface. When necessary, water slowly in order to soak the ground thoroughly.

Care of Trees and Shrubs

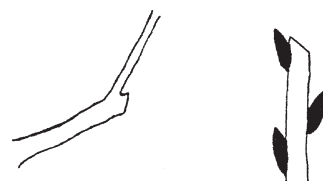
Pruning and Supporting Newly Installed Plants

An initial pruning may be needed immediately after planting bare-rooted plants to remove competing multiple leaders. Do not over-prune or development will be inhibited. Container-grown and B&B plants require only the removal of all broken and damaged branches. Be sure not to ruin the natural growth habit of shrubs, and do not remove the central leader of shade trees.

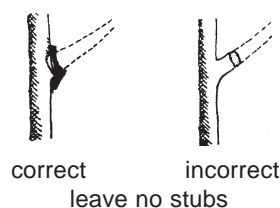
Prune One Year After Planting



1. sucker
2. broken branch
3. heading back side branch
4. water sprout
5. interfering branch
6. double leader



head back to a side branch.... or bud



Corrective pruning to improve branch structure is usually practiced the following spring after planting. With all newly planted woody plants, it is more successful to avoid heavy pruning at planting if you can ensure that the plants will be well-watered during their first year or two in the ground. Pruning reduces the leaf area; this reduces transpiration but also reduces the leaf area which produces photosynthates for root growth. Since the plant will not resume a normal growth rate until the root system is re-established, one is better off to avoid wilting by watering than by canopy pruning. This also avoids a proliferation of suckers in the inner canopy.

Most shrubs do not need to be supported after planting unless bare-root stock has been planted that is quite large, or very tall B&B specimens have been used. If so, use the same techniques for shrubs that will be described for trees.

Staking and guying are rarely required. If a tree is planted in a very windy location or on a slope, support may be needed until new anchoring roots develop. Drive two stakes into the ground on opposite sides of the tree, being sure to sink them firmly into native soil. Use a wire, cushioned with rubber hose, to secure the tree to the stakes. Stake the tree at the level of its lowest branches.

All support should be removed within one year after planting. The tree should have become established in this period of time, and it has been reported that tree trunks are weakened and growth is actually reduced if the supports are left in place for longer periods of time.

Plants in your landscape will require periodic maintenance to produce the best effects. This includes winterizing, mulching, watering, pruning, and fertilization when necessary.

Fertilizing Trees and Shrubs

Ornamental trees and shrubs planted in fertile, well-drained soil should not require annual fertilization. Trees and shrubs that are growing well don't require extra nutrients. If you have ornamentals that are not growing well, fertilization may be one of the practices recommended to correct the problem.

Plants which are growing poorly will exhibit any or all of these symptoms:

- light green or yellow leaves
- leaves with dead spots
- leaves smaller than normal
- fewer leaves and/or flowers than normal
- short annual twig growth
- dying back of branches at the tips
- wilting of foliage

Symptoms of poor growth may also be caused by inadequate soil aeration or moisture; by adverse climatic conditions; by improper pH; by disease or by other conditions. You should attempt to determine the specific cause in each particular situation and apply corrective measures. Do not assume that

an application of fertilizer will quickly remedy any problem which is encountered.

The cause of poor growth may or may not be evident. Ornamentals transplanted or disturbed by construction within the past 5 or 10 years may be in shock, their root systems having been disturbed. Pruning to balance the top growth with root growth at the time of the injury will help, followed by adequate irrigation.

Good soil drainage to a depth of at least 2 feet is needed for ornamental trees and shrubs in the landscape planting. Plants on poorly drained soil may exhibit one or more nutrient deficiency symptoms. If the site is low, install drainage tile to remove excess water before the plants are set out. The tile must have an outlet at a lower level so the water can move out freely. If the use of tile is impractical, or a suitable outlet for the water cannot be arranged, the grade may be elevated by using fill to provide better runoff and drainage conditions.

Most trees and shrubs tolerate a wide range of soil acidity. A range of pH 6.0 to 7.0 is suitable for most landscape plants. Plants such as pine, spruce, or fir do best in a pH range of 5.0-6.0 while broad leaf evergreens such as andromeda, rhododendron, or blueberry prefer 4.5-5.5.

Soil pH can be lowered quite easily for these acid-loving plants. You should first have the soil tested to determine the pH level. If the pH is too high, it can be lowered by using sulfur, iron sulfate, or aluminum sulfate. Sulfur is preferred for lowering pH.

Apply sulfur at the rate of 1 ½ lb. per 100 sq. ft. to reduce a loam soil 1.0 pH value and make it more acid. Use half as much on sandy soil and 1½ times as much on clay soils. After several months, test the soil again to determine the effectiveness of treatment.

Small trees and shrubs that are in need of nutrients should have ½ to 1 cup of 10-10-10 fertilizer spread evenly under their branches in early spring. Fertilization in summer may cause serious injury the following winter, by stimulating late growth that will not harden off before frost.

For large trees research indicates that complete fertilizers usually are not essential. To determine how much nitrogen is needed, measure the diameter of the tree at breast height. For each inch of diameter, apply 2-3 lbs. of a 10 percent nitrogen fertilizer such as 10-10-10 or 10-3-6. Application

should be made in the spring, or in late fall after two hard frosts and before the ground freezes. If the tree is large, it is best to split the fertilizer application; one in spring and the remainder in fall. Spread the fertilizer evenly under the branches. Soluble nitrates will move into the soil quite readily.

If turfgrass is present, it is important to place the tree fertilizer beneath the grass roots to avoid burning. A crowbar is effective by punching holes 2 ½ feet apart, 10 inches deep, all around the tree extending past the tips of branches. Approximately one cupfull of fertilizer is placed in each hole followed by watering.

Depending on the reason a large tree is doing poorly, fertilization might be called for each year. However, a feeding program must be coupled with proper cultural practices. For example, neglecting necessary insect or disease control and failure to remove dead wood from a large shade tree will negate the positive effects of fertilization.

Shrubs are fertilized in the spring at bud break or in late fall during the hardening off process. A fertilizer such as 10-10-10 or 10-3-6 slow release is surface applied at a rate of 1-2 lbs. per 100 sq. ft. depending on the size of the shrubs in the bed.

A moderate rate of growth and good green color is all that is desired of woody plants. Excessive vigor, which is evident by lush green leaves and long shoot growth, is undesirable. Such plants are more susceptible to injury by cold in winter, are more likely to be broken during wind and sleet storms, and usually will have a shorter life than those making moderate growth.

Mulching Plants

For year-round benefits of mulching, apply a 2-4 inch mulch of aged sawdust, fresh shredded bark or wood chips, or peat moss around shrubs, roses, and recently planted trees. This mulch will conserve moisture and help suppress the growth of weeds and grass.

Sawdust or shredded bark from the inside of a large pile may go through anaerobic decomposition and become very acid, with a pH of about 3.0 and a pungent odor. Such material is toxic to plants. In some cases, mice may tunnel in the mulch and cause damage by chewing the bark from the stems of shrubs. This is more likely to happen when coarse materials like straw or hay are used. The best control is to keep the mulch back about 6 inches from the stems, use wire mesh mouse guards, or

trap the mice. A circle of crushed stone or coarse, sharp cinders about 6 inches wide around the stems may also be helpful.

Woody roots that anchor trees penetrate deep into the soil, but herbaceous roots that take up water and nutrients are shallow and wide-spreading. These roots function best when they do not have to compete with lawn roots. For this reason, it is desirable to mulch under trees, as far out as the branches extend if possible. A 2 to 3 inch layer of organic mulch prevents weeds, conserves water, and stabilizes soil temperatures. Both organic and inorganic mulches can be useful in the home landscape. Some of the more readily available ones include:

Sawdust

A 2-3 inch layer of sawdust provides good weed control. If fresh sawdust is applied around growing plants, add ½ pound of actual nitrogen per 10 cubic feet of sawdust to prevent nutrient deficiency; fresh sawdust contains a great deal of carbon and very little nitrogen, and its breakdown requires that microorganisms take nitrogen from the soil. There is often a problem with crusting of fresh sawdust, with resulting impermeability to rainfall. Sawdust is best used for garden paths and around permanent plantings. It is readily available from sawmills. One problem associated with mounding sawdust close to the stems of plants is its' impermeability and water tends to run off away from the plant.

Bark

A 2- to 3-inch layer of one of several types of bark provides good weed control. Bark is slow to decompose and will stay in place. Shredded bark decomposes more quickly than the stone types. Wood chips are often available free or for a small charge from professional tree pruning services, or may be purchased in large bags at retail stores. Bark makes a very attractive mulch, and is especially recommended for mulching around trees and shrubs.

Hay or straw

Although not typically used around trees and shrubs, a 3- to 4-inch layer of hay provides good annual weed control. Some people use a 1-foot, compacted layer of straw, pulling back the layer for planting. This provides excellent weed control. These materials decompose quickly and must be replenished to keep weeds down. They stay in place and will improve the soil as they decay. Avoid hay which is full of weed seed and

brambles. Fresh legume hay, such as alfalfa, supplies nitrogen as it quickly breaks down. Hay and straw are readily available in rural areas, but city dwellers may not be able to obtain hay. Straw, on the other hand, may be purchased at most garden centers, often commanding a high price. Both are recommended for vegetable and fruit plantings but not for ornamental plantings. Hay or straw will make a good habitat for meadow voles.

Pine needles

Pine needles make an excellent mulch for acid-loving plants, but can be too acidic for many plants if incorporated into the topsoil. Pine needles are readily available and are best used around shrubs and trees, particularly acid-loving types.

Grass clippings

A 2-inch layer of grass clippings provides good weed control. Build up the layer gradually, using dry grass, to prevent formation of a solid mat. Clippings will decompose rapidly and provide an extra dose of nitrogen to growing plants, as well as making fine humus. Avoid crabgrass and grass full of seed heads. Also, do not use clippings from lawns which have been treated that season with herbicide or a fertilizer/herbicide combination ("weed and feed" types). They are an excellent source of nitrogen to help increase microbial activity in the compost pile, especially for those gardeners without access to manures. Be on the lookout for slugs.

Leaves

A 2- to 3-inch layer of leaves, after compaction, provides good weed control. Leaves will decompose fairly quickly, but are easily blown unless partially decomposed. Leaves are usually easy to obtain, attractive as a mulch, and will improve the soil once decomposed. They are highly recommended as a mulch.

Peat moss

A 2- to 3-inch layer of peat moss will give fair to good weed control. This material is slightly acid, and thus suitable for use with acid-loving plants. However, peat tends to form a crust if used in layers thick enough to hold weeds down, or it may be blown away. Peat is also a relatively expensive mulching material which breaks down rapidly. It is suitable for incorporation into the soil.

Compost

A 2- to 3-inch layer of compost is a fair weed control. Most compost, however, provides a good site for weed seeds to grow but is an excellent soil amendment. A layer of compost may be used on over-wintering beds of perennials, such as asparagus or berries, to provide nutrients and help protect crowns.

Gravel, stone, and sand

A 1-inch layer of rock will provide fair weed control. They make a good mulch for permanent plantings, as around foundation plants and in alpine gardens. None of these mulches are effective in controlling erosion; soil will wash right out from under rocks, and sand will be swept away. Availability varies with area.

Watering Plants

Watering plants correctly is vital for developing and maintaining a landscape planting. Lack of water can cause a plant to wilt and ultimately dry up and die. Excessive water can cause root rot, in which case the plant wilts because it is oxygen-starved, and consequently, is unable to take up moisture. As a rule, plants are capable of withstanding moderate drought more easily than too much moisture. For this reason, it is important to water thoroughly, yet allow the soil to become fairly dry between waterings.

Wilting is a condition brought about in plants when roots are unable to supply sufficient moisture to the stems and leaves. Wilting for short periods of time will not harm plants; over a prolonged period, however, it will cause permanent damage. Sometimes a plant will wilt on a hot day because moisture is evaporating from the leaves faster than the roots can supply it. If there is ample soil moisture, the plant will absorb water in the evening to firm up the stems and leaves.

In late summer or early fall, it is not uncommon to experience a sustained period of wilting, particularly of broad-leaved evergreens such as rhododendrons. Latest research establishes this condition as the cause of much leaf damage typically attributed to winter desiccation. When the leaves hang down and no rain is predicted, it is advisable to provide prolonged, deep watering to keep the leaves turgid. To wet the soil at least 6 inches deep requires 1 to 2 inches of surface water.

Container-grown landscape plants may be susceptible to drought stress once they are transplanted to the landscape. Drought stress occurs because the well-drained organic mix in which the plants are grown in the nursery is prone to rapid loss of moisture due to plant transpiration (loss of water from plant leaves) and evaporation from the soil surface. Even though moisture is available in the soil surrounding the organic mix, it does not move into the transplanted root ball rapidly enough to prevent moisture stress from developing. Research has shown that the available moisture in the container mix can be depleted in about 2 days in the absence of irrigation. For this reason, these plants are watered at least every other day while in the nursery. This routine should be followed after transplanting until the root system penetrates the surrounding soil back fill (approximately 3 to 4 weeks) where moisture is available for absorption by the plant.

Care must be taken not to allow the transplanted root ball to dry out because the organic mix is very difficult to rewet once it becomes dry. Water can be applied to a drought-stressed plant where the root ball has become very dry and not successfully relieve the moisture stress because the medium does not readily absorb the applied water. In this case, water should be applied 2 or 3 times each day until the root ball has been rewet.

To maximize the effectiveness of watering practices:

Know the condition of the soil.

It is important to observe how quickly soil dries out after a rain or watering. For example, a clay-type soil will be watered less frequently than a sandy one. Clay soil drains slowly, sandy soil quickly. The addition of organic matter to the soil will increase drainage in clay soil and moisture retention in sandy soil.

Learn the cultural requirements of plants being grown.

Different plants have different water needs; azaleas require more moisture than lilacs. The use of good reference books will provide the gardener with this information. It is particularly important to provide a relatively high soil moisture supply for evergreen plants during the fall before the ground freezes. The leaves of such plants continue to lose water during the winter, especially when the temperature is above 40° F. If the soil is dry, the plants may become desiccated,

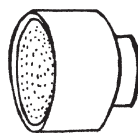
turn brown, and die. Therefore, water shrubs several times during the late fall if the soil moisture supply is low.

Mulch plantings to reduce the frequency of watering during dry spells.

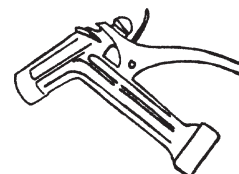
Mulches help keep soils cool and reduce water loss through evaporation.

As with any job, to water properly, the gardener must have the right tools; hose, water breakers, sprinklers, sprinkling can, and utility pails.

When acquiring a hose, make sure it will reach all plants in the garden so the end can be placed at the base of any plant. When watering individual plants with a hose, attach a water breaker to the end. It will concentrate a soft flow of water in a small area, but will not wash away soil. Don't use a trigger-type nozzle; it will wash soil away from the roots.



water breaker

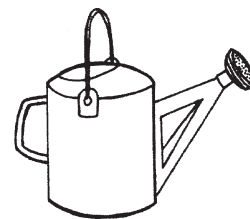


trigger-type nozzle

There are many types of good sprinklers on the market. One type is a spike sprinkler on a riser that can be adjusted from 2 feet to 4 feet. This sprinkles above shrubs and small trees, providing excellent water distribution. However, much water is lost to evaporation. Sprinklers should not be used on windy days, because water will be blown away from the desired location. Sprinklers may also encourage foliar diseases such as Anthracnose on maple and Powdery Mildew on Azaleas.



spike sprinkler on riser



sprinkling can

Sprinkling cans and utility pails are adequate when watering only one or two small shrubs or trees, but are generally inadequate for watering in the landscape.

Trickle or drip irrigation is increasing in popularity. Systems are easy to set up by do-it-yourselfers.

They are also rather inexpensive when compared with other methods of irrigation. Less water is required because it is placed in the root zone. There is also a savings in electricity.

If the soil is dry when preparing a hole for a new plant, dig the hole and fill it with water the day before the plant goes into the ground. This allows the soil time to absorb water and does not create a muddy condition during the planting. Once a tree or shrub has been planted a thorough soaking after planting eliminates air pockets around roots.

It is important when planting (particularly container-grown material) to avoid covering the top of the root ball with more than $\frac{1}{2}$ to 1 inch of native soil. Otherwise water can be diverted sideways through the native soil and not soak down into the root ball where it is needed.

When there is an extended period without rain during the summer, new plants should be deeply watered once a week. By allowing the soil surface to dry out somewhat between waterings, major root development will be at greater depths where soil moisture is highest. Plants watered frequently but lightly will have roots close to the surface, making them more vulnerable to wilting. They will not become well-established and will have little drought tolerance. This happens with automatic overhead sprinkler systems that are designed to go on for a short period of time each night and only moisten the surface. This practice also encourages foliar diseases in midsummer.

During cool seasons, less watering is necessary because evaporation from the leaves and soil is slow. Normally, abundant rainfall during spring and autumn diminishes the need for watering. During any dry autumn before the ground freezes, all garden plants should have a thorough watering to help prevent root damage from cold winter temperatures. Root damage from unusually cold temperatures shows up in the spring and early summer in the form of leaf drop because there are not enough roots to support the foliage.

With well-established groups of woody plants, watering should be done every 10 days during prolonged dry spells. Since root systems of established plants are rather widespread and deep, it is vital that enough moisture be put down to reach them. A general rule of thumb is that 1 inch of water penetrates 6 inches of soil. If a sprinkler is set up to water a group of plants, a coffee can should be placed in range of the sprinkler. When 1 inch of

water accumulates in the can, 1 inch of water has been distributed in the soil.

The best time to water is in the morning when air temperatures are lower than at midday, thus reducing evaporation. Evening watering is less desirable because wet foliage at night promotes fungal disease development.

Winterizing Trees and Shrubs

It is often necessary to give a little extra attention to plants in the fall to help them over-winter and start spring in peak condition. Understanding certain principles and cultural practices will significantly reduce winter damage of ornamentals.

Causes of winter damage. Types of winter damage can be divided into three categories: desiccation, freezing, and breakage.

Desiccation, or drying out, is a significant cause of damage, particularly on evergreens. This occurs when water is leaving the plant faster than it is being taken. There are several environmental factors that can influence desiccation. The needles and leaves of evergreens transpire some moisture even during the winter months. During severely cold weather, the ground may freeze thereby cutting off the supply of water. If the fall has been particularly dry, there may be insufficient ground moisture to supply the roots with adequate water. Water loss is greatest during periods of strong winds and during periods of sunny, mild weather. The heat of the sun can cause stomates on the lower sides of the leaves to open, increasing transpiration. Small, shallow-rooted plants are often injured when alternate freezing and thawing of the soil heaves the plants from firm contact with the soil and exposes the roots to wind desiccation. Injury due to desiccation is commonly seen as discolored, burned evergreen needles or leaves. It is most severe on the side facing the wind. It can be particularly serious if plants are near a white house where the sun's rays bounce off the siding, causing extra damage.

Freezing injury can take several forms. New growth stimulated in early fall by late summer fertilization may not have had time to harden off sufficiently to survive sudden drops to below freezing temperatures. Ice crystals rupture cell walls. This damage will show up as dead branch tips and branches. A sharp temperature change between day and night may freeze the water within the trunk of a tree, causing it to explode or split open in a symptom called frost cracking. If

not severe, these cracks seem to close when warm weather arrives, but the wood fibers within may not grow back together. Bark of young trees sometimes cracks open on the southwest side of the trunk if the warm winter sun warms the tissue and a sudden, severe drop in temperature occurs at sunset. This problem is commonly called sunscald. Both frost crack and sunscald are less common in healthy, fully hardened trees with vigorous, far reaching root systems.

The sun can also prematurely stimulate the opening of flowers or leaf buds in the spring which might be killed by freezing night temperatures. Bud injury due to the cold temperatures of winter also occurs in the dormant state on more tender trees and shrubs. Flowering shrubs, like Forsythia, may lose their flower buds, although their leaf buds usually come through. Root injury may occur in containers and planters, or balled and burlapped (B&B) stock which has been left exposed during the winter. Lethal root temperatures can start at 23° F on some species.

Breakage of branches is usually related to snow and ice. Two causes of damage by snow and ice are weight and careless snow removal. High winds compound the damage done when ice is on the plant. Damage may take the form of misshapen plants or may actually result in broken branches and split trunks.

Avoid Damage.

Much of the disappointment and frustration of winter-damaged plants can be avoided by planning ahead.

Select Hardy Plants.

Grow plant materials that are native or are known to be winter hardy in your area.

Select Appropriate Site.

When planting broadleaf evergreens that are known to be easily injured, such as some varieties of rhododendron, azalea, daphne, and holly, select a location on the north, northeast, or eastern side of a building or other barrier where they will be protected from prevailing winds and intense winter sun. These exposures will also delay spring growth, thus preventing injury to new growth of flowers from late spring frost. Another situation to avoid is planting hemlocks and other needle evergreens on dry soils, in full sun, and on windy sites.

Avoid Poorly Drained Soil.

Avoid low spots that create frost pockets and sites that are likely to experience rapid fluctuations in temperature. Since heavy snow and ice can cause much damage to branches and trunks, it is important that plants be placed away from house eaves and other snow or ice collecting areas, where snow or ice is likely to fall or slide onto the plants.

Follow Recommended Cultural Practices.

Following recommended cultural practices has been shown to be highly effective in reducing winter injury to ornamentals. Plants that are diseased or deficient in nutrients are more susceptible to winter injury than strong, healthy plants.

Avoid late summer or early fall fertilization while plants are still active, as this stimulates late fall growth which is easily killed by the cold.

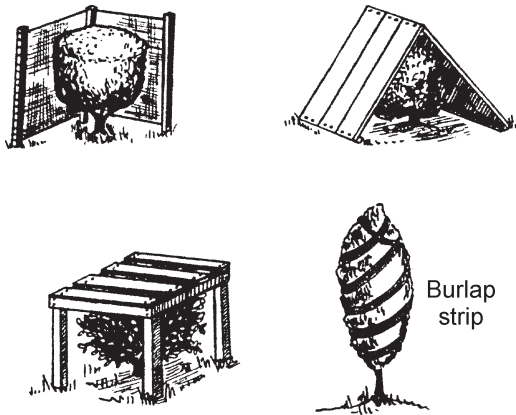
Pruning by thinning is effective in reducing damage by ice and snow. Small diameter branches are encouraged which are less prone to breakage. Particularly important is the removal of any weak, narrow-angled, V-shaped crotches. Avoid late-summer pruning which stimulates new, tender growth and reduces the supply of nutrients available to the plant through the winter. Do not prune needle evergreens in late fall or sun scald will result.

Proper watering can be a critical factor in winterizing. If autumn rains have been insufficient, give plants a deep soaking that will supply water to the entire root system before the ground freezes. This practice is especially important for evergreens. Mulching is an important control for erosion and loss of water. A 2-inch layer of mulch material such as tan bark, fir bark, pine needles, wood chips, or sawdust will reduce water loss and help maintain uniform soil moisture around roots. Mulching also reduces alternate freezing and thawing of the soil which heaves some shallow-rooted plants and can cause significant winter damage.

Protecting Against Damage.

The best protection against winter damage is to put the right plant in the right place. Special precautions can be taken to protect plants during the winter. Antidesiccant compounds are sold in many garden centers and supply catalogs. Apply in the fall and again during a January thaw when temperatures are above 50° F.

Small evergreens can best be protected by using wind breaks made out of burlap, canvas, or similar materials. Wind breaks help reduce the force of the wind and also shade the plants. Windbreaks can be created by attaching materials to a frame around a plant. A complete wrapping of straw or burlap is sometimes used. Black plastic should be avoided as a material for wrapping plants. During the day it builds up heat inside, increases the extreme fluctuation between day and night temperatures, and may speed up growth of buds in the spring, making them more susceptible to a late frost. Certainly these various boxes, shields, and wrappings add nothing to the aesthetics of your winter landscape. If ornamentals require annual protection measures to this extent, it would be wise to move them to a more protected location or replace them with hardier specimens.



Collecting snow should be removed with a broom. Always sweep upward with the broom to lift snow off. When the branches are frozen and brittle, avoid disturbing them. Wait until a warmer day.

Winter Injury.

After a particularly severe winter, many plants may show substantial injury. Damage symptoms are discolored, burned evergreen needles or leaves, dead branch tips and branches, heaved root systems, and broken branches. At winter's end, remove only those branches that are broken or so brown that they are obviously dead. Do not remove branches when scraping the outer bark reveals a green layer underneath. The extent of winter damage can best be determined after new growth starts in the spring. Wait until midsummer before pruning because even dead-looking plants may still be alive.

If discoloration on narrow-leaved evergreen needles is not too severe, they may regain their green color or new foliage may be produced on the undamaged stem. Broad-leaved evergreens showing leaf damage will usually produce new leaves if branches and vegetative leaf buds have not been too severely injured. Damaged leaves may drop or be removed. Prune to remove badly damaged or broken branches, to shape plant, and to stimulate new growth.

Replant small plants with root systems partially heaved out of the ground as soon as the soil thaws. Unless the root system is small enough to be pushed easily with the fingers into the soft soil, dig the plant, retaining as much as possible of the root system within a soil ball, and replant it.

Special care should be given to plants injured by winter's cold. The dry months of July, and August can be particularly damaging as the plants are weak and often unable to survive the stress of drought. Be sure to water adequately.

Storm-Damaged Trees.

Treatment of storm-damaged trees requires wise decisions and prompt action if the maximum in repair work is to be achieved. Repairs come in two stages: First Aid for immediate attention; and Follow-Up Work to be distributed over a period of several months to several years.

Decision factors:

- Is the tree damaged beyond practical repair? If over 30 to 50 percent of the main branches or trunk are severely split, broken, or mutilated, extensive repair efforts are questionable.
- Desirability of species. Some less desirable species are: black locust, Siberian (Chinese) elm, box elder, mulberry, true poplars, silver-leaf maple, arborvitae.
- Location. If too close to power lines, building or other structures, the tree may need to be removed.
- Soundness. Extremely old, low-vigor trees might not have recovery ability.
- Special values. Rarity of species or variety, sentimental and/or historical value.
- Purpose of the tree. Does it serve a true landscape purpose or value?

Workmanship factors:

- Remove only the branches necessary for immediate repairs. Too much removal of wood in one season can help create such problems as sunscald, weak branching habits, and soft sucker growth.
- Major tree work, such as wiring and bracing should be done by a professional arborist.
- Observe safety precautions relative to falling branches, use ladders, and avoid contact with power lines.
- Promptly remove all debris such as broken branches and prunings to help eliminate breeding grounds for insects and diseases.

Follow-up considerations:

- Gradually prune and reshape trees for balance and general appearance over a period of 3 to 5 years.
- Control devitalizing conditions such as sucker sprouts, insects, and disease damage.
- Replacement trees, if necessary, should be carefully selected for durability, general adaptation, and mature size.

Special Fruit Tree Treatment.

Broken limbs should be cut back to a strong side branch. When cutting terminal growth to a side branch, make the cut so it continues the line of direction of the side branch so the wound will heal quickly. If damage to fruit trees has destroyed over 50% of the bearing surface, it may be wise to remove the entire tree. Damage that exposes large areas of wood has traditionally been treated with commercial wound dressing, but current research indicates that this often slows recovery.

Protecting and Repairing Trees During Construction

The location of a house on a lot should be carefully planned to utilize existing trees and avoid unnecessary and destructive grading. Trees of desirable species located where they may serve a useful purpose in the landscape should be protected during the construction process. Consult a person with training and experience in landscaping to help select those trees which should be saved and those which should be removed.

Plan protective measures before construction starts. If construction damage occurs, start corrective

practices as soon as damage is observed. The longer an injury is neglected, the greater will be the ultimate damage to the tree.

Trees may respond quite differently to various types of injury. Under some circumstances, death may occur soon after the tree has received apparently minor damage. In other cases, trees may grow quite satisfactorily after being subjected to severe injury. In most situations, an effort should be made to save well-located trees of young or middle age.

Protecting Trees During Construction.

Trees which are not needed in the landscape planting should be eliminated before construction starts. This will provide more space for the soil from the basement, building supplies, and the movement of equipment involved in building the house.

Protect trees which are to be saved for future landscape use by placing tall, conspicuous stakes at the ends of the branches on the sides where trucks or bulldozers will be operating. As added protection, attach heavy fencing to the stakes.

General Corrective Practices.

Damage to trees during construction operations usually involves impairment of the water and nutrient supply system. This is true when either the roots or top of the tree is damaged. Therefore, three corrective procedures should be applied: 1) prune back and thin out the branches to reduce water requirement; 2) irrigate as needed to maintain an adequate moisture supply in the soil, and 3) apply fertilizer to help stimulate renewed growth if the top of the tree is damaged.

Prune back the top in proportion to the severity of the root damage. In cases of serious injury, cut back and thin out the branches quite drastically.

Bruised and Peeled Bark.

Damage to tree trunks caused by careless operation of trucks or other equipment should be assessed. If the damaged area is less than 25% of the circumference of the trunk, the wound should gradually heal over and permanent injury may be minimal. If the damage involves more than 50% of the circumference, the tree may be seriously reduced in vigor. It may lose branches and be quite unsightly. The corrective procedures of top pruning, irrigation, and fertilization should be practiced until the tree recovers or it is evident that the tree will not recover satisfactorily and should be removed.

Broken Branches.

Remove tree branches which have been broken from any cause. Damage near the end of a branch can be eliminated by cutting back to a strong lateral. Cut the entire branch off close to the trunk at the “collar” when the broken area is near the base. See the Pruning chapter for more details.

Root Damage by Trenches.

Digging of trenches for water or gas lines, or for foundations for buildings, walks, or drives may damage the root system of nearby trees. If such injury cannot be avoided, the top of the tree can be pruned back and thinned out to reduce demand for water from the remaining roots.

Roots Covered By Pavement.

Roots which are covered by pavement may be deprived of air and moisture which are essential for growth. If the covered area involves only a portion along one side of the tree, satisfactory growth should continue. If the entire area around the tree is paved, the surface should be porous to allow water and air to penetrate. If brick or flagstone is used, joints should not be mortared. When pavement is nonporous, an opening should be left around the trunk of the tree. This opening should be at least 6 feet in diameter for small trees. The opening should be larger around mature trees. Roots of trees extend as much as three times beyond the spread of the branches.

Fertilization of Damaged Trees.

When the root system of a tree has been damaged during construction, a moderate application of fertilizer may be beneficial. Use 2 pounds of 5-10-5 formula per tree for each inch of trunk diameter measured 3 feet above the ground. Follow method of application described in section ‘Fertilizing Trees and Shrubs’.

Grading Around Trees.

A majority of the feeder roots of trees are located within a foot of the surface and typically extend several feet beyond the end of the branches. The topmost roots of trees are usually covered with about 4 inches of soil. Topsoil should not be disturbed around landscape trees during the construction operation unless absolutely necessary to change the grade.

The removal of soil around ornamental trees may damage or destroy vital feeder roots. If damage is not too severe, a layer of fertile loam may be

applied over the exposed roots. The tree should recover and continue active growth.

In some situations, the grade level around the house may need to be changed and involve the addition of soil around trees. If the ground level is raised 6 inches or more, the air supply to the roots will be reduced and the tree may decline in vigor or die. Beech, most maples, poplar, hickory, walnut, and most evergreen trees are particularly susceptible to injury of this type.

Grade changes so severe as to require tree wells are to be avoided.

Mower Wounds Can Kill Trees

Injury and infection started by lawnmower wounds can often be the most serious threat to tree health on golf courses, parks, and home lawns.

Extensive research has been conducted on the importance of wounds in tree health care. This research has led to significant adjustments in pruning, cabling, bracing, injection, and cavity treatment.

Lawnmowers cause the most severe injury during periods when tree bark is most likely to slip, in early spring during leaf emergence, and in early fall during leaf drop. If the bark slips, a large wound is produced from even minor injuries.

Most tree injuries occur when mower operators attempt to trim close to tree trunks with a power mower. This can be prevented by removal of turf around trees and replacement with mulch or by hand trimming. Care must also be used to avoid harming trees with filament-line weed-trimming machines. They can do a great deal of damage to the bark, particularly on young trees.

The site of injury is usually the root buttress, since it flares out from the trunk and gets in the path of the mower. However, injury is also common anywhere from the roots to several feet above the ground. Although large wounds are most serious, repeated small wounds can also add up to trouble.

Wounds from lawnmowers are serious enough by themselves, but the wounded tree must also protect itself from pathogens that invade the wound. These microorganisms can often attack the injured bark and invade adjacent healthy tissue, greatly enlarging the affected area. Trees can be completely girdled from microbial attack following lawnmower wounds.

Decay fungi also become active on the wound surface, and structural deterioration of the woody tissues beneath the wound will often occur. Many wounded trees which are not girdled may eventually break off at the stem or root collar due to internal decay.

