



Growing Bonsai

Publication Information

Information in this file was originally published under the title *Growing Bonsai* by the United States Department of Agriculture, Home and Garden Bulletin No. 206, issued August 1973 by the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402, Stock No. 0100-02772.

The publication was originally prepared by Henry M. Cathey of the Plant Genetics and Germplasm Institute at Northeastern Region agricultural Research Service.

This pdf version was edited and compiled by C. Scott Clark, technical writer and web page designer. Other than minor stylistic changes in text, no other changes were made in content, except for the substitution of color photographs, which replace the original black and white illustrations. Captions were changed as needed. Most photographs (Figures 1-13) were taken by Peter Voynovich and were originally shown in *Outstanding American Bonsai* by Randy Clark, published in 1989 by Timber Press, Portland, OR. Figure 14 was photographed by Saxon Holt, published in 1994 in *Bonsai: an Illustrated Guide to an Ancient Art* by Sunset Publishing Corporation, Menlo Park, CA.

This document was last updated on April 6, 1999. This information is also located at http://www.peak.org/~cscottc/bonsai-site/Growing_Bonsai.htm. Please send comments or questions to cscottc@peak.org.

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Introduction

Bonsai are miniature trees grown in pots. The aim of bonsai culture is to develop a tiny tree that has all the elements of a large tree growing in a natural setting. This look is achieved, principally, by branch and root pruning and shaping, but other factors are also important. The texture of the trunk, its look of age, the moss and the under plantings in the container — all contribute to the illusion of a miniature tree as it is seen in nature.

A presentable bonsai can be created in a few seasons. Cultivating these miniature potted trees is both an intriguing hobby, and a means of adapting a wide range of plants to specialized and decorative uses. Bonsai require daily watering during their growing season, and, because the plants are rooted in shallow pots, careful pruning.

Bonsai are kept outdoors most of the year, but — from time to time — these miniaturized versions of nature are brought indoors for display. Only certain tropical trees, shrubs, and vines can be continually kept indoors full time as bonsai.

Bonsai, as an art form, stems from ancient oriental culture. It originated in China and was developed by the Japanese. In the 13th century, the Japanese collected and potted wild trees that had been dwarfed by nature. These naturally formed miniatures were the first bonsai.

When demand for the small trees outstripped the supply, Japanese gardeners began to train bonsai from native trees. They shaped the trees to give them the illusion of age and naturalness. Over the years, the Japanese devised standards of shape and form, which gradually began the classic bonsai styles.

American bonsai are much freer in concept and style than Japanese bonsai. American bonsai growers have recognized that the horticultural and aesthetic rules are important, but are specifically aimed at Japanese culture. Because of this, Americans have taken oriental styles and applied them to plants never grown by the Japanese. Therefore, the rigid procedures and names used by the Japanese are not used in this bulletin.

Principles of Bonsai

Not all plants are equally effective as bonsai. To produce a realistic illusion of a mature tree, look for plants with the following characteristics:

- Small leaves or needles.
- Short internodes, or distances between leaves.
- Attractive bark or roots.
- Branching characteristics for good twig forms.

All parts of the ideal bonsai — trunk, branches, twigs, leaves, flowers, fruits, buds, roots — should be in perfect scale with the size of the tree. Plants used for bonsai should have small leaves, or leaves that become small under bonsai culture. Plants with overly large leaves, such as the avocado, will look out of

proportion if chosen for bonsai. Sycamores also develop leaves that are too large. Certain species of both maple and oak trees usually respond well to bonsai culture and develop leaves that are in proportion.

Among the plants with small leaves and needles are spruce, pine, zelkova, pomegranate, and certain oaks and maples.

Plants chosen for bonsai should have attractive bark, and the trunk must give the illusion of maturity. The trunk should have girth, but must remain in proportion to the entire tree. The trunk should taper gradually toward the top of the tree. Sometimes one or two of the main branches must be shortened to emphasize the vertical line of the trunk and give the trunk a balanced appearance.

To give the appearance of age, the upper one-third of the root structure of a mature bonsai is often exposed. This is especially effective if the roots have good girth and form. Twisted and tangled roots should be straightened before potting or repotting a tree to achieve an aged appearance. Bonsai from nursery stock, and trees collected from the wild, should have a root system that will — when exposed — add to the appearance of the finished bonsai.

Plants have a “best profile” just as people do. Decide on the front of the tree at the very beginning, because planting and shaping are done with the front of the tree in mind. However, you may change your ideas about the plants ultimate shape as you clip and prune.

The front of the bonsai should offer a good view of the main trunk, which must be clearly visible from the base to the first branch, typically about one-third the way up. Everywhere on the tree, but mostly from the front, the branches should look balanced and appear to be floating in space; they should not appear lopsided or top-heavy. The branches should not be opposite one another with their lines cutting horizontally across the trunk. The branches give the bonsai the dimension and establish the tree’s basic form.

A bonsai should have a harmonious arrangement of branches without unsightly gaps. Flaws can be spotted by looking down on a bonsai. Upper branches should not overshadow lower branches.

Before deciding on the shape of your bonsai, study the tree carefully, and take into account the natural form of the species. Observe the way mature trees of the same kind grow in their natural setting to achieve an impression of age and reality.

Decide on the final shape and size of your bonsai before starting. Make a rough sketch of what you wish to create and use it as a guide.

Choosing a Style

Basic Styles

Bonsai can be classified into five basic styles: formal upright, informal upright, slanting, cascade, and semi-cascade. These classifications are based on the overall shape of the tree and how much the trunk slants away from an imaginary vertical axis.

The numerous Japanese bonsai styles are principally variations of these five basic styles. The styles given in this bulletin apply to trees with single trunks. The single trunk style is the basic design that is simplest to shape because the one trunk determines the overall composition.

Formal Upright

The formal upright style has classic proportions and is the basis of all bonsai. It is the easiest for a beginner to develop because it requires the least experimentation, avoids the problem of selective pruning, and should almost immediately become a displayable bonsai.

In this style, the form is conical or sometimes rounded and the tree has an erect leader and horizontal branches. One of the branches is lower and extends a little farther from the trunk than the others (Figure 1). Also, the lowest two branches are trained to come forward on the front side of the tree, one slightly higher than the other. The third branch of this style extends out in the back of the tree at a level between the two side branches to give the plant depth (Figure 2).

Plants in the formal upright style look best in oval or rectangular containers. Do not center the plant when placing it in the container. Plant it about a third of the distance from one end.

In choosing a nursery plant for this style, make sure the trunk rises from the ground in a fairly straight line. The trunk should be straight and not fork or branch out for the total height of the tree. Trim off the small branches or twigs that are too close to the base and near the main stem. These branches detract from the overall composition.

Informal Upright

The informal upright style has much the same branch arrangement as the formal upright style, but the top — instead of being erect as in the formal upright style — bends slightly to the front. This bend makes the tree's branches appear to be in motion and enhances the look of informality (Figures 3 and 4).

The informal upright style looks best in an oval or rectangular container. It should be planted, not in the center of the container, but a third of the distance from one end.

Many nursery trees are naturally slanted. This makes them well suited to the informal upright style. Check the tree's slant by looking down at the trunk from above — from this angle the top should slant to the front. If this view is not attractive, you may move the root ball to slant the tree in another direction.

If you choose a vertical tree at the nursery, and want to train it in the informal upright style, simply tilt the plant when potting it. When you do this, trim the branches and foliage so they are scaled to the size of the tree.



Figure 1. Note the off-center placement of this redwood (*Sequoia sempervirens*) in its oval container. This tree was trained in the formal upright style, which is considered the easiest for the novice bonsai grower.



Figure 2. The formal upright style features a straight trunk, and a bottom branch that is lower and extends further from the trunk than its opposite. This specimen is a Mugho pine (*Pinus mugo* 'Mugo').

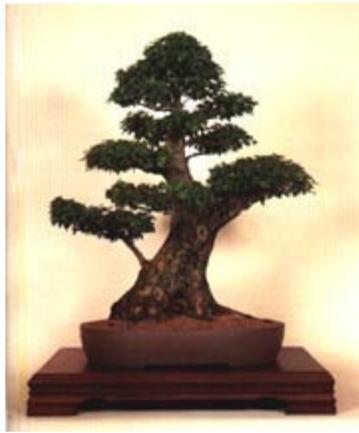


Figure 3. This trident maple (*Acer buergerianum*) bonsai, is trained in the informal upright style. The style is similar in branch placement to the formal upright style, but differs because of the angularity of the trunk.



Figure 4. The trunk in the informal upright style bends slightly to the front. This specimen is 32 years old, a San Jose juniper (*Juniperus san jose*) in training since it was a seedling.

Slanting

In the slanting style, the trunk has a more acute angle than in the previous styles. The lowest branch should spread in the direction opposite to that in which the tree slants. The top of the tree is bent slightly toward the front (Figures 5 and 6). The lower branches are arranged in groups of three, starting about one-third the way up the trunk.

Slanting trees in nature are called “leaners” — trees that have been forced by the wind and gravity into nonvertical growth. The attitude of the slanting style falls between the upright and cascade styles. This style looks best planted in the center of a round or square container.

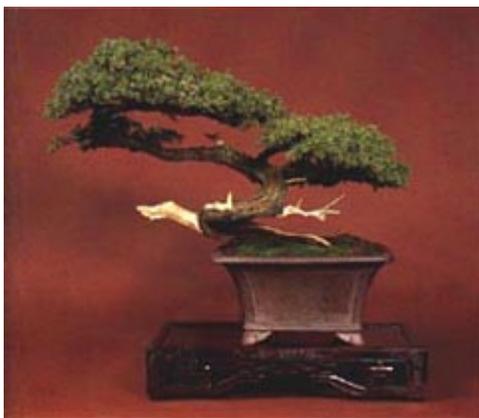


Figure 5. This common juniper (*Juniperus communis*), estimated to be about 80 years old, was collected in 1979, and has been trained in the slanting style of bonsai. In this style, the lowest branch spreads in the opposite direction to the slant of the tree.



Figure 6. In the slanting style the trunk has a more acute angle than in the informal upright style. This specimen is a *Lantana*, salvaged from a construction sight in 1959.

Cascade

In the cascade style the trunk starts by growing upward from the soil, then turns downward abruptly, and reaches a point below the bottom edge of the container. For this reason, the container should be placed on the edge of the table, or on a small stand (Figures 7 and 8).

The cascade style has most of its foliage below the soil surface. This style is representative of a natural tree that is growing down the face of an embankment.

Training a tree in the cascade style takes longer than in the slanting style. Choose a low-growing species instead of forcing a tree that normally grows upright into an unnatural form. Bend the whole tree forward so one back branch is vertical and the side branches fall naturally.



Figure 7. Elephant bush (*Portulacaria afra*), trained in the cascade style, has a characteristic leader, which descends below the bottom edge of the container. A cascaded bonsai usually looks best in a round or hexagonal container.



Figure 8. The cascade style of bonsai represents a natural tree growing down the face of an embankment. This specimen is a three leaf Akebia (*Akebia trifoliata*) estimated to be about 30 years old.

A cascaded planting usually looks best in a round or hexagonal container that is higher than it is wide. The tree should be planted off-center from the cascading side.

Semi-Cascade

The semi-cascade style has a trunk that is allowed to grow straight for a certain distance, and then is cascaded down at a less abrupt angle than in the cascade style (Figures 9 and 10). The cascading branches are thought of as the front of the tree, and the back branches are trained closer to the trunk than in the other styles. The semi-cascade should not reach below the bottom of the container, but should go below the level of the soil surface.

Plants that are well adapted to the cascade and semi-cascade styles are prostrate junipers, and flowering plants such as chrysanthemums, wisteria, willows, and star jasmine.

Before potting a tree for bonsai in any of the five styles, keep in mind the image of how the tree will stand in the container. Don't plant a tree one way, and then uproot it to make a change. Keep your overall theme in mind when planting bonsai. Upright trees should have a stabilized look in the container; slanted and cascaded styles often have their upper root surfaces exposed to imitate plants that grow this way in nature.

No matter what style you choose — whether single trunk specimens or groups of trees from single roots — everything depends on your selection of plant material, and your ability to visualize the bonsai's final form.



Figure 9. This Shimpaku juniper (*Juniperus chinensis* 'Sargentii' 'Shimpaku') in a hexagonal container was trained in the semi-cascade style. Prostrate junipers and flowering plants are well adapted to cascade and semi-cascade styles.



Figure 10. The semi-cascade style has a curving trunk that does not reach the bottom of the container as it does in the cascade style. This example is a little leaf Cotoneaster (*Cotoneaster microphylla*).

Plant Selection Guide

Trees and Shrubs

The following alphabetical list of plants includes trees and shrubs suitable for traditional bonsai. This is not intended to be a complete list. Specialty nurseries often have a wide selection of dwarf and semi-dwarf varieties of many of these species. Dwarf plants, however, do not always convey the same impression as their full size counterparts because the growth habit is quite different.

Apricot: *Prunus* species

Arborvitae: American, *Thuja occidentalis*; Oriental, *Thuja orientalis*

Azalea: Hiryu, *Rhododendron obtusum*; Indica azalea, *Rhododendron indicum* Kurume; hybrids

Beech: American, *Fagus grandifolia*; European, *Fagus sylvatica*

Birch: White, *Betula alba*

Boxwood: *Buxus* species

Burningbush: *Euonymus nana*

Cedar: Atlas, *Cedrus atlantica*; Deodara, *Cedrus deodara*

Cherry: *Prunus* species

Cotoneaster: *Cotoneaster* species

Crabapple: *Malus* species

Cryptomeria: *Cryptomeria japonica* and cultivars

Cypress: Bald, *Taxodium distichum*; Dwarf hinoki, *Chamaecyparis obtusa* var. *compacta*

Elm: American, *Ulmus americana*; Chinese, *Ulmus parvifolia*; Siberian, *Ulmus pumila*

Fir: *Abies* species

Firethorn: *Pyracantha* species

Ginkgo: *Ginkgo biloba*

Goldenrain: *Koelreuteria paniculata*

Gum: Sweet, *Liquidambar styraciflua*

Hawthorn: English, *Crataegus oxycantha*; Washington, *Crataegus phaenopyrum*

Heather: *Calluna vulgaris*

Hemlock: Canadian, *Tsuga canadensis* and cultivars
 Hornbeam: American, *Carpinus caroliniana*; Japanese, *Carpinus japonica*
 Ivy: *Hedera helix* and cultivars
 Jasmine: Winter, *Jasminum nudiflorum*
 Juniper: *Juniperus* species and cultivars
 Locust: Black, *Robinia pseudoacacia*
 Maple: Amur, *Acer ginnala*; Hedge, *Acer campestre*; Trident, *Acer buergerianum*
 Oak: English, *Quercus robur*; Pin, *Quercus palustris*; Scarlet, *Quercus coccinea*; White, *Quercus alba*
 Peach: *Prunus* species
 Pine: Bristlecone, *Pinus aristata*; Japanese white, *Pinus parviflora*; Japanese black, *Pinus thunbergi*; Mugo, *Pinus mughus*; Swiss stone, *Pinus cembra*; White, *Pinus strobus*
 Plum: *Prunus* species
 Pomegranate: Dwarf, *Punica granatum nana*
 Quince: Japanese, *Chaenomeles japonica*
 Snowbell: Japanese, *Styrax japonica*
 Spruce: *Picea* species and cultivars
 Willow: Weeping, *Salix blanda*
 Wisteria: Japanese, *Wisteria floribunda*
 Yew: *Taxus* species and cultivars
 Zelkova: Graybark elm, *Zelkova serrata*

House Plants

American gardeners have taken bonsai concepts and have applied them to houseplants. By combining traditional procedures for handling houseplants with bonsai concepts of design, growers have created different bonsai styles. The following alphabetical list consists of woody plants (native to the tropics and subtropics of the world) that have been grown as indoor bonsai. These plants can be obtained from either local or specialized nurseries.

Acacia: *Acacia Baileyana*
 Aralia: *Polyscias balfouriana*, *Polyscias fruticosa*, *Polyscias guilfoylei*
 Bird's Eye Bush: *Ochna multiflora*
 Camellia: *Camellia japonica*, *Camellia sasanqua*
 Cape-Jasmine: *Gardenia jasminoides radicans*, *Gardenia jasminoides*
 Citrus: *Citrus* species (calamondin, kumquat, lemon, lime, orange, and tangerine)
 Cherry: Surinam, *Eugenia uniflora*
 Cypress: Arizona, *Cupressus arizonica*; Monterey, *Cupressus macrocarpa*
 Fig: Mistletoe, *Ficus diversifolia*
 Herb: Elfin, *Cuphea hyssopifolia*
 Hibiscus: *Hibiscus rosa-sinensis* Cooperi
 Holly: Miniature, *Malpighia coccigera*
 Jacaranda: *Jacaranda acutifolia*
 Jade: *Crassula* species
 Jasmine: *Jasminum parkeri*; Orange, *Murraea exotica*; Star, *Trachelospermum jasminoides*
 Laurel: Indian, *Ficus retusa*
 Myrtle: Classic, *Myrtus communis*
 Oak: Cork, *Quercus suber*; Indoor, *Nicodemia diversifolia*; Silk, *Grevillea robusta*

Orchid Tree: *Bauhinia variegata*
Oxera pulchella
Pepper Tree: California, *Schinus molle*
Pistachio: Chinese, *Pistacia chinensis*
Plum: Natal, *Carissa grandiflora*
Poinciana: Royal, *Delonix regia*
Pomegranate: Dwarf, *Punica granatum nana*
Powderpuff Tree: *Calliandra surinamensis*
Serissa foetida
Shower Tree: *Cassia eremophila*

You can also obtain books that supply information about growing plants indoors from your local library.

Obtaining Plants

There are many ways to obtain bonsai. At the beginning it is best to work with the more common plants. Most are obtainable at local nurseries. Plants that are native to the area where you live often make fine subjects for bonsai. But make sure these plants meet the bonsai requirements of size, leaf, trunk, and scale (Figure 11).

Some old favorites grown as bonsai because of their classical good looks are Sargent juniper (*Juniperus chinensis* Sargentii); Japanese black pine (*Pinus thunbergii*); wisteria (*Wisteria floribunda*, *Wisteria sinensis*); flowering cherries (*Prunus subhirtella*, *Prunus yedoensis*); and gray bark elm (*Zelkova serrata*).

Among the plants recommended for the beginner are:

- Firethorn (*Pyracantha coccinea* or *Pyracantha fortuneana*), which is an evergreen with small leaves;
- Cotoneaster (*Cotoneaster dammeri*), which has characteristics similar to those of firethorn;
- Dwarf pomegranate (*Punica granatum nana*), which is deciduous, and has tiny green leaves; and
- Juniper (*Juniperus scopulorum* or *Juniperus virginiana*), which is a hardy evergreen with heavy foliage that takes well to pruning.

In addition to nursery stock, plants for bonsai can be collected from the wild or propagated from plants in your garden (See discussion of propagation). Growers can now purchase mature bonsai created in this country; these plants have recently become available at selected nurseries. Mature bonsai plants also can be imported from Japan, but only deciduous varieties ship well.

Collecting Plants from the Wild

The job of finding plants in the wild that adapt well to bonsai is difficult for the beginner. Traveling in wild terrain where such specimens are found can be hazardous. Also, at least a year must pass before a plant collected this way can be containerized, and much care is necessary to insure survival during this period. Wild plants, however, often look older than they actually are and make handsome specimens.



Figure 11. A group planting in any of the bonsai styles makes use of only one species of tree. A Banyan (*Ficus neriifolia* 'Regularis') is shown here.

The best time for collecting plants in the wild is during March and April, when new growth or leaves have not yet begun to sprout. Here, the collector must recognize when the wild plant is in its dormant period.

On a collecting trip the following items will be helpful: a small collapsible shovel; polyethylene sheeting and string for wrapping rootballs; sphagnum moss for packing around the rootball; a container of water for wetting leaves and rootball; and a small crowbar for getting roots out of rocks.

Remember the following points when taking plants from the wild:

1. Get permission to dig from the owner of the property.
2. Do not randomly dig wild plants. Make sure that the plant you are removing is not on your State conservation list. Remember that nothing can be removed from national parks and similarly conserved areas.
3. When digging the plant you want, try not to injure the taproots. Get as much soil around the roots as possible. Older trees will require greater care and a slower training schedule.
4. After you cover the roots and soil with wet sphagnum, wrap the rootball in polyethylene film. Wet the branches with water frequently.
5. At home, unwrap the rootball carefully. (It is not necessary to unwrap the rootball if it is wrapped in burlap.) Plant the tree in loose garden soil in a location that is protected from the sun and wind.
6. Water, and examine the roots of the new plant for several months. Feed the plant sparingly.
7. After at least 1 year, the plant can be dug up and placed in a container. (Large trees may have to go into a succession of smaller containers before they are ready.) Trim the roots around the base carefully so the plant will fit into its container.
8. If shaping is necessary when potting a collected tree, prune the branches lightly.
9. Two years after the plant has been collected from the wild, start it on a regular training program.

Importing Mature Plants

If you are going to import bonsai trees from Japan, it is best to do so during their dormant period. Such plants are subject to severe fumigation before they are allowed to enter this country and thus are likely to be harmed by fumigation.

To find out which trees can be imported, check with the Plant Protection and Quarantine Programs, Animal and Plant Health Inspection Service, U.S. Department of Agriculture, Hyattsville, MD 20782.

Bonsai plants are now available that have been trained in the United States. These plants have the advantage of being acclimated to various areas of the country.

Nursery Plants

The easiest and best method for the beginner to obtain bonsai is to buy nursery stock and develop his own. These plants come in 1- and 5-gallon cans and their root systems have become adapted to cramped condi-

tions. Buy only young, healthy plants when purchasing nursery stock. When searching for potential bonsai among nursery stock, do the following:

- Look for plants that are well rooted and well branched. The plant must be able to withstand severe initial pruning.
- Inspect the overall plant and then push back the foliage and examine the base from all sides. See if the foliage is full enough to be shaped into an interesting bonsai. Check to see if branches are where you will need them.
- Do not purchase a plant that cannot be easily transplanted to a pot.

Do not thin the root system excessively all at once when placing the plant in a smaller container. By thinning the roots gradually and reducing the root system, safely and over a period of years, you will not damage the plant. If you prune and shape first and neglect thinning the roots, some plants may die.

Shaping Bonsai

Overall Design

Strive for flowing form when shaping bonsai. Visualize the overall theme and try to get a three-dimensional effect. Remember to select the front, back, and sides of your bonsai before pruning, and don't forget to examine the roots that will influence the growth of these areas.

For overall design, the "rule of thirds" is a simple concept to use as a basis for obtaining a pleasing form for your bonsai. The "rule of thirds" (Figure 12) assures you of getting the proper division of space. In this aid to design, the total space is divided into thirds both horizontally and vertically.

Use your pruning shears judiciously to make changes that benefit your bonsai. Fine adjustments are made by wiring, bending, and thinning (removal of branches). Remember that a badly designed bonsai will not grow well.

Before shaping a plant into a bonsai, decide whether the best attitude of the tree is upright, slanted, cascaded, or semi-cascaded. Examine the general form of the tree and note whether it is straight or twisted. Match the potential of a tree to the style that fits it best. Decide whether the base will rise from the soil level or whether you will expose bare roots.

Three basic operations are necessary to establish the basic form in bonsai culture: pruning, nipping, and wiring.

You will need the following basic tools: a pair of sharp hook-and-blade pruning shears; a garden trowel; blunt sticks; a pair of sturdy wire cutters; copper wire of various lengths; and a sprinkling can. Also useful are scissors for trimming leaves, tweezers for nipping, and brushes for cleaning topsoil.



Figure 12. The "rule of thirds" is a useful design aid when planning the overall form of your bonsai. The total space of plant and container is divided into thirds, both horizontally and vertically.

Pruning

Nursery plants are often overgrown and need much pruning to establish their best form. Through pruning, you control growth and form by removing excess foliage and ugly limbs.

Some points to remember when pruning are:

- Make all cuts above a bud, a side branch or a main fork of the tree. Remove all buds except those on the outside of the trunk to force the growth outward and upward.
- Leave stubs flush with the stem; long stubs serve as an entry for insects.
- Avoid cutting back so far that you weaken the main branches.

When pruning, keep branches growing toward an open space instead of toward each other or the trunk. Do not shear bonsai as you would cut a hedge; shearing makes the plant look artificial.

After deciding on the foliage form for your bonsai, remove all crossed branches until the tree takes on the form you selected.

If you want to slant a tree that has been growing in an upright position and insure that branches take a natural shape, prune it in an upright attitude, and then tip it to where it should be and work on it that way.

Next, cut back new growth and thin out excess branches. When pruning an upright style, remove unneeded side branches and leave the center ones that will fill out as they grow.

Space out your pruning schedule, even if the plant has heavy foliage. Plants must have a certain number of leaves for photosynthesis.

Protect pruning scars when removing heavy wood from thick branches or the trunk. Cut the wood as close to the trunk as possible, pare the stump flush, then scoop it out with a chisel, making a shallow wound that will heal without looking unsightly. Treat these wounds with grafting compound and they will be unnoticeable after healing. Several years must pass before the bark will grow over these cut surfaces and replace the scar tissue.

Nipping

A tree usually requires one heavy pruning in its life to establish its basic form. After this initial pruning, shaping is done by nipping. Nipping, or pinching back, is done to shape and develop the trunk and to control the overall size of the plant. Nipping controls new growth before it becomes so dense that it must be pruned.

A twiggy plant can be made more dense when it is nipped. When all terminal buds on a branch have been pinched, several side shoots develop. In this way growth is stimulated. This will give the plant a bushier appearance.

Nipping is done not only to shape a plant but also to develop more luxuriant foliage. As the new growth tips show up, nip them with your fingers, twisting rather than pulling. Also nip off tiny spurs that appear on the trunk or along heavy branches. These may develop into unsightly suckers that will leave scars when removed. Do not overdo this removal; be careful not to damage the foliage you leave on the plant.

After the top of a bonsai is pruned, trim the roots. Try to keep all fibrous roots and maintain a balance, if possible, of one branch for one root. Remove any roots that were damaged in digging. Leave the surface root system intact and make it appear as if the roots cling to the soil surface. Prune roots with sharp, sloping cuts to avoid damaging them.

Wiring

The wiring and bending of branches that give bonsai its shape is unique to the art. Wiring is done after pruning when the tree has been thinned to essential branches.

Copper wire is usually used for shaping bonsai because it is flexible. The sizes of copper wire that are best for bonsai are 10, 12, 14, 16, and 18. (No. 8 wire is heavy and should be used only for the trunk.) Wire as light as No. 16 should be used for very thin branches, and for tying rather than bending.

Wire evergreen trees only during their dormant period when the branches can be shaped without damaging growth. Wire deciduous trees only during their growing season.

The day before you wire a plant do not water it; this will make the branches more flexible. Once a branch has taken on its trained form, remove the wire, straighten out its twists, and flatten it with a mallet for reuse.

Wiring and shaping should begin at the lowest point of the tree, working upward. Do the following when wiring:

- Anchor the end of the wire at the base of the tree before winding it.
- Push the end of the wire deep into the soil.
- Wire from the trunk to the main branch.
- Use a foam pad under the wire to prevent damaging the bark.
- Keep the turns about 1/4-inch apart and spiral upward at a 45-degree angle.
- Do not wire too tight and do not damage the leaves or stems.

One length of wire can serve for two branches by anchoring the center of the wire at the trunk.

After wiring, the plant is shaped or bent by hand. The trunk and main branches are gradually bent in the planned direction. Never try to straighten a branch that has been bent; this may split the bark.

Branches sometimes snap, even when carefully wired and bent. If the branch is not completely broken, rejoin the broken ends, and wind some garden tape around the break. These fractures often heal quickly. If a branch snaps off, prune back cleanly at the first side branch.

Wire should be kept on the plant for not more than 1 year. Remove the wire before the bark becomes constricted; ridges will form if the wire is left on too long. When removing a wire, start at the outer most end of the branches, and take care not to harm leaves, twigs, or bark.

Containers for Bonsai

Training Pots

Most plant material for bonsai has long roots that will not fit into a bonsai container. For this reason a training pot is used. The training pot is larger than a bonsai container and holds the heavy roots, which are gradually cut back, for a period of years until small, fibrous roots develop.

All kinds of containers are used for training pots: clay saucers, plastic containers, and wooden boxes of many different sizes. Many of these clay and plastic pots are available at garden centers. The azalea pot and the bulb pan are especially suitable. The pot should be just large enough to accommodate the tree's root system. It should be similar in shape to the bonsai pot, which will eventually replace it.

For example, an upright tree, destined for a low, flat container, should be grown in a fairly low training pot. A cascading tree, to be planted later in a high bonsai pot, should be trained in an ordinary flowerpot.

Make sure that all training pots you use have drain holes at least 1/2-inch in diameter.

Choosing Pots

Choose a pot in which to display your bonsai when the training of your bonsai is sufficiently advanced. The size and shape of this pot will depend on the size and shape of the tree. Trees trained in the cascade and semi-cascade styles look best in round or rectangular pots. Plant the trunk in the center of the pot with the branches sweeping down over the side. Place upright trees slightly off-center (one-third the distance from one end) in oval or rectangular pots. Place trees with thick trunks and dense foliage in deep, heavy pots. Branches of a bonsai should harmonize with the shape of a pot. If the branches are longer on one side than the other, place the trunk off-center in the pot (Figure 13).

The color of the pot should contrast with the tree's foliage. Use white, tan, or green pots for trees with brightly colored flowers or fruits. Use unglazed pots with pines and deciduous trees.

Generally, bonsai containers come in five shapes: round, oval, square, rectangular, and hexagonal. In each shape there is a wide variety of sizes. Bonsai containers can be obtained from some of the larger nurseries. Chinese or Japanese hardware stores, and stores that specialize in imported items, also offer containers.

Bonsai plants must be anchored to their containers until the roots take hold. One method used to anchor the plant is to tie it down with wires leading up through the screens that are placed over the drainage holes in the container. After tying the plant to the container, adjust the plant's elevation.

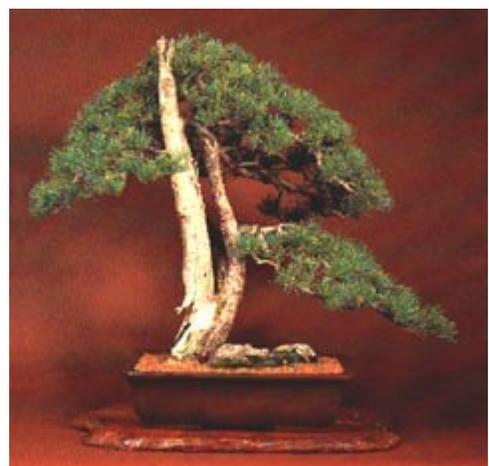


Figure 13. In addition to deadwood, the trunk of this bonsai plant (*Pinus flexilis*) has cracks and scaly ridges that give it a look of age. Note the off-center placement of the tree in the container.

Potting

At the end of the first year, the tree is usually transplanted from its training pot (or from the ground) into a pot suitable to its dimensions. Retain some of the original soil, and trim the roots if necessary. Cut away any abundant growth of new roots at the base of the trunk before repotting. If only a few roots have formed around the taproot, prune these roots slightly. Prune the taproot again at the end of the second year, and cut it short at the end of the third year. This final cutting should be done when the new roots have appeared at the base.

Repotting

Repotting of bonsai plants is usually needed when soil insects damage the plants, or when soil is in poor condition. Sometimes, however, a soil condition can be corrected without repotting and disturbing the roots of the plant. This is done by adding new soil around the outer surface, or by removing plugs of soil and replacing them with a free-draining soil mix.

The health of trees grown as bonsai depends largely on the care of changing the soil in the pots and the proper pruning of surface roots. A healthy bonsai puts out new surface roots every year. The growth of these roots makes it difficult for vital water and air to penetrate the soil. The surface roots will be nourished but the main root near the trunk will die. Therefore, periodically cut back the main root and thin out the surface roots.

A tree's rate of growth determines the frequency of repotting. Pines and spruces, for example, need repotting only once every 3 to 5 years; flowering and fruiting trees, every year or — depending on the variety— every second year. Repot quick-growing species, such as willow and crape myrtle, at least twice a year. These intervals apply to healthy trees that have received proper care.

Repot your plants in the early spring when the first new buds appear. A secondary season occurs in late summer or early autumn when, for a short time, the roots check their growth. It is dangerous to repot in late spring and early summer when the leaves are just open and still tender.

When the tree is in a dormant state it is unable to establish itself in the new soil and root diseases are likely. For this reason, bonsai must never be repotted in winter, except when kept in greenhouse culture.

Growth Media

Soil mixtures vary a great deal depending on geographical area and personal preferences. There are many conflicting ideas on the type of mix to use.

Many growers find that bagged potting soil is satisfactory for potting bonsai plants. If you use bagged soils, make sure they contain sphagnum peat moss and coarse perlite in equal quantities. Bagged soils are available in most garden supply houses.

Generally, mixing soil should have rapid drainage, a structure that permits fine roots to develop, and contains decaying humus and mineral nutrients. It should also be free of root rot and have a pH similar to the tree's native soil. Try to avoid high levels of dry fertilizers in the soil mix. Screen bagged soil to remove the fine clay particles.

A good basic mixture consists of one-third clay, one-third humus, and one-third sand. If you live in an area where humus is not available, then obtaining an artificial soil mix from your garden store or nursery is the only answer. river or quarry sand can be purchased from lumber yards and variety stores where it is sold under the name of white aquarium sand.

Seasonal Care

Spring Care

Spring is the time when new bonsai are started. It is the time for any pruning and training of last season's bonsai. The plants then have a whole growing season to readjust to these changes.

Summer Care

Bonsai are very sensitive and thrive best in localities that offer cool nights, sunny days, and mist or rain almost daily. Most of the United States does not have this climate, so special provisions must be made to compensate for the lack of desired climatic conditions. Extremes in light, rain, and wind are to be avoided.

Place your bonsai on a platform or table in your garden where the plants can receive 3 to 5 hours of direct sunlight a day. The site should be shaded, preferably in the afternoon. If the area is subject to drying winds, put up screening around the plants to protect them. Screening also serves to provide the plants with shade.

Water the entire bonsai — plant and soil — daily. If you skip even 1 day you can permanently damage the plant. Make sure your plants are located where rain can fall on them. However, plants should not remain wet or waterlogged for long periods.

Fall Care

During this period bonsai must be prepared to endure the approaching cold. Plant growth must be slowed. Water plants less frequently to slow growth, and, when growth slows, reduce applications of fertilizers.

Do not prune or cut any branches after mid-August. Do not use artificial night lighting (incandescent filament lamps) on plants after August 1. To reduce winter dieback of flowering trees and maples make light applications of 0-10-10 fertilizer.

Winter Care

A major problem in winter is to protect bonsai against low temperatures and drying winds. Bonsai can only be left outdoors in climates where temperatures drop no lower than 28 F degrees. This is not the case throughout most of the United States, so a greenhouse, pit, or coldframe is necessary.

Winter frosts will seldom bother bonsai that are sheltered under the foliage of a spreading tree. Watch out, however, during the frost period for drying soil.

Coldframes

It is easy to construct a simple coldframe for bonsai. Before the ground is frozen, dig a hole at least 1-1/2 feet in the soil. Make the hole as long and as wide as you need for all your plants. Line the sides of this hole with exterior grade plywood, which extends 6 inches above the surface. Put 4 to 6 inches of gravel in the bottom of the hole, set your plant containers on this gravel, and spread straw around and over them. Put a loose-fitting cover on the frame made of polyethylene sheeting or any similar material.

Be sure the top of your coldframe is strong enough to withstand a heavy load of snow. Ventilate on days when the air temperature is above 40 F degrees to keep the plants cool and dormant.

To purchase a coldframe kit, check your local nurseries or see catalogs of mail-order garden supply houses.

Watering

In the summer, during hot weather when the temperature is over 90 F degrees, water the bonsai plants one or more times a day. If the plants are in an unusually sandy soil, they will require watering three or more times a day.

In early autumn, follow the watering directions for late spring. In late autumn, follow the watering directions for early spring.

In winter, keep the trees in a coldframe and ventilate the plants on one or more sides to keep them dormant. Check for dryness every 2 weeks. Water the plants every second day, or less, as required. Keep in mind that far more bonsai are killed by overwatering than by a lack of water.

Fertilizer

To maintain plant growth use fertilizer to supply nutrients. Maintain the nutrient level in the soil mix throughout active growth with monthly applications of a diluted liquid fertilizer. Apply fertilizer only before and during active growth. For a liquid fertilizer you can use a typical house-plant fertilizer (20-20-20 or its equivalent) diluted to one-quarter strength on the label.

Propagating Bonsai

Seedlings

Growing bonsai from seeds is a slow process, unless you intend to grow plants whose maximum height will be 6 inches. A more nearly perfect tree can be grown from seed because the trunk can be shaped from the beginning to suit the grower. To develop the trunk rapidly, plant seedlings in the ground outdoors; seedlings are kept outside from 2 to 5 years, depending on the type of material planted and its rate of growth. Each spring, dig up the plant and prune its roots just as if it were in a pot. When you choose a seedling, select one that has small leaves to begin with. For example, silk oak and cherimoya seedlings have been successfully grown indoors.

Cuttings

Starting bonsai from cuttings is faster than starting them from seed. Make cuttings in the late spring and early summer, just before the buds open or after the new growth has hardened. Plants that propagate easily from cuttings are olive, willow, cotoneaster, firethorn, azaleas, and boxwood.

Layering

This is a simple and convenient method of rooting branches in the soil while they are still attached to the parent plant. The branches immediately have a well-established form and branch structure. Layering often results in good, balanced root systems.

Mid-spring is the best time to do soil layering. Choose a branch that has good form. Make sure the branch is low enough to reach the ground. Mark a point about one foot from the end of the branch and dig a hole in the ground 4 inches deep. In the soil, mix equal parts of sand and peat moss made from ground bark.

Make a slanting cut on the underside of the branch. Insert a pebble in this cut. Bend the branch back in the hole, taking care not to crack the branch. Anchor the bent branch in a vertical position. Then cover it with prepared soil, and water it. In 9 months to a year the branch (layer) should have rooted. When this occurs, it is ready for transfer to a bonsai pot. (Remember to cut the stem just below the original cut when removing it for transfer.)

Softwood plants that are layered will root in 6 to 8 weeks. When they have rooted, be sure to cut them from the parent plant and pot them. Pinch off new buds until the layered stem develops a mature root system. Remember to keep the layered area moist so that the root systems will develop quickly.

Plants that propagate well by the layering method are rhododendrons, maples, pomegranate, cryptomeria, and many others.

Grafting

Grafting is complex and requires patience and practice, especially by the novice bonsai grower. It is not as successful as the other methods of propagation. One of the drawbacks for bonsai is that even after a graft has taken, an ugly scar remains. The “side” or “notch” grafting methods have the advantage of hiding the scar.

Grafting is usually done in the winter or early spring when the buds are dormant. There are numerous methods of grafting, but the most popular among bonsai enthusiasts are “cleft” and “whip” grafting.

Displaying Bonsai

Indoor Display

Bonsai from miniature forest trees must live outdoors all the time. They are brought into the house for short periods on special occasions. Bonsai from forest trees will die if kept too long indoors, particularly in

overheated rooms. These bonsai may be brought inside once or twice a week for 2 or 3 hours during winter, spring, and autumn. They should not be brought inside in summer unless the room is well ventilated.

Before you bring your bonsai indoors to display them, water them first and let them drain well. Wipe all dirt and dampness from the container.

Bonsai look well placed in front of a plain wall on a raised stand. The Japanese display bonsai on a platform raised a few inches above the floor in one corner of the living room. Paintings and scrolls are hung against the wall at the back. Other objects, such as ceramic ware and flower arrangements, are grouped with the bonsai on the platform.

If you set bonsai on a low stand or table, try using a small Japanese folding screen behind it. These stands can be purchased in oriental stores. It's a good idea to contrast the shape of the stand with the bonsai container; the height of the stand should harmonize with the height of the tree.

Bonsai in the Garden

Display bonsai in the garden on simple shelves set on concrete blocks. Place the shelves against an outside wall away from trees, and protect them from the sun. Other good locations for bonsai are slat benches and decks, either in the garden or adjoining the house (Figure 14). Bonsai in large containers look better displayed alone. Place them on some kind of stand, rather than setting them on the ground.



Figure 14. Bonsai tables for garden display are high enough to prevent cascaded plants from touching the ground. The overhead lath provides shady areas for some plants.

This document was last updated on April 6, 1999. This information is also located at http://www.peak.org/~cscottc/bonsai-site/Growing_Bonsai.htm. Please send comments or questions to cscottc@peak.org.