BONSAI BASICS

STUDENT HANDBOOK

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OBJECTIVE

This workbook was designed to aid the aspiring Bonsai artist by providing an overview of the many topics associated with Bonsai Basics. Most of the information included in this workbook was obtained from several online sources and has been reviewed to assure its accuracy.

Along with the information from a qualified Bonsai artist, this handbook's material forms a detailed compilation of valuable facts and guidelines which will assist the aspiring artist in the growing and training of Bonsai.

INTRODUCTION

Bonsai (盆栽, "tray planting") is a Japanese art form using trees grown in containers. Similar practices exist in other cultures, including the Chinese tradition of penjing from which the art originated. Japanese tradition dates back over a thousand years. "Bonsai" is a Japanese pronunciation of the earlier Chinese term *penzai*. The purposes of bonsai are primarily contemplation (for the viewer) and the pleasant exercise of effort and ingenuity (for the grower), by contrast with other plant cultivation practices, bonsai is not intended for production of food or for medicine. Instead, bonsai practice focuses on long-term cultivation and shaping of one or more small trees growing in a container.

A bonsai is created beginning with a specimen of source material. This may be a cutting, seedling, or small tree of a species suitable for bonsai development. Bonsai can be created from nearly any perennial woody-stemmed tree or shrub species that produces true branches and can be cultivated to remain small through pot confinement with crown and root pruning. Some species are popular as bonsai material because they have characteristics, such as small leaves or needles that make them appropriate for the compact visual scope of bonsai.

The source specimen is shaped to be relatively small and to meet the aesthetic standards of bonsai. When the candidate bonsai nears its planned final size it is planted in a display pot, usually one designed for bonsai display in one of a few accepted shapes and proportions. From that point forward, its growth is restricted by the pot environment. Throughout the year, the bonsai is shaped to limit growth, redistribute foliar vigor to areas requiring further development, and meet the artist's detailed design.

The practice of bonsai is sometimes confused with dwarfing, but dwarfing generally refers to research, discovery, or creation of plant cultivars that are permanent, genetic miniatures of existing species. Bonsai does not require genetically dwarfed trees, but rather depends on growing small trees from regular stock and seeds. Bonsai uses cultivation techniques like pruning, root reduction, potting, defoliation, and grafting to produce small trees that mimic the shape and style of mature, full-size trees.

HISTORY

While the art of bonsai has long been associated with Japan, it actually originated first in China, and then spread eastward to Korea and then Japan. The art of bonsai was spread by Buddhist monks who wished to bring the "outdoors" inside their temples. From ancient paintings and manuscripts, we know that "artistic" container trees were being cultivated by the Chinese around 600 AD, but many scholars feel that bonsai, or at least potted trees, were being grown in China as far back as 500 or 1,000 BC. Bonsai first appeared in Japan during the 12th century.

It is no accident that artistic plant cultivation originated in China. The Chinese have always loved flowers and plants, and the country is naturally endowed with a rich diversity of flora. The Chinese also had a passion for gardens. In fact, many of these gardens were on a miniature scale and included many miniature trees and shrubs, planted to reinforce the scale and balance of their landscapes. The Chinese, however, were also infatuated in miniaturization as a science in its own right. They believed that miniature objects had concentrated within them certain mystical and magical powers.

The development of Chinese and Korean ceramics played an important role in the development of bonsai as we know it today. Without the development of beautiful Chinese containers, bonsai trees would not have been admired as much as they have been. Bonsai literally means "tree in a tray." The tree and container must form a single entity. Even to this day the most desired containers for the finest Japanese bonsai are often antique Chinese containers.

Bonsai has evolved and developed along different lines in China and Japan. Chinese bonsai is still very much in the ancient tradition, and often appear "crude" to the uninformed. On the other hand, the Japanese styles are more pleasing and naturalistic. The Japanese trees are for the most part more refined and better groomed. Both types have their own individualistic charms and admirers.

In the post-World War II era most of the bonsai seen in the United States and Europe are Japanese in origin. The monopoly that Japan has enjoyed until recently is coming to be shared with a number of other countries, although the quality of Japanese trees continues to be of the highest quality.

Finally, we owe a great debt to the Japanese and Chinese artists for developing this beautiful art and for keeping it alive for almost 2,500 years. Without their enthusiasm, artistic tradition, and patient stewardship, we would not be enjoying bonsai as we know it today. The aesthetic sensibilities of bonsai, which have their roots in the Zen Buddhist tradition, contribute significantly to the complete bonsai experience.

WHAT MAKES GOOD BONSAI

1. Signs of good health and stability such as leaf color and well settled, natural looking moss. No signs of carelessness and abuse such as badly healed pruning scars or scars from wire left on too long.
2. A strong well shaped trunk springing naturally from the soil and moving upwards towards the apex in an even taper.
3. A good fanning out of surface roots (nebari) from the base of the trunk gradually disappearing into the soil.
4. A good, well-proportioned head of branches which are well spaced and appear to spring naturally from the trunk or from larger branches.
5. The tree is as natural looking as possible considering its species, style, and size.
6. The pot must be in proportion to the tree to form an artistic unity.
7. The tree should be placed in the pot so as to create a visual balance
8. Flowers, fruit, and leaves must be in proportion.
9. A tree growing with its roots clasping a rock must really adhere to the rock, not just wrap around it.
10. A tree should be planted well raised in its pot so that the bole can be clearly seen over the rim of the pot when viewed at eye level.
11. Stones, moss or other covering on the surface of the soil mok natural and in scale.

RULES OF BONSAI

Trunk and Nebari Rules

Height should be six times the caliper of the trunk.

Trunk should lean slightly toward the viewer.

Trunk should flare at base to visually anchor the plant.

Roots should radiate from the flare.

No eye-poking roots (directly at viewer).

Apex should lean toward viewer.

Trunk should taper as it ascends. No reverse taper.

Grafts should match under stock and scion so that they are unobtrusive, or be placed low enough to disappear into the nebari.

Curves in trunk should not result in 'pigeon breast' (roundness toward viewer).

Apex should finish in the direction set by the base. 'Flow' should be maintained.

Trunk line should not move 'back on itself'. It relates to the flow of the tree. A trunk line that moves back on itself creates a 'C' curve.

For formal and informal upright, the apex should be over the base.

In informal uprights, too many 'S' curves will be tiresome.

As a tree ascends the curves should be closer together (related to branch placement).

A tree should have only one apex.

Twin tree trunks should divide at the base, not higher up.

Branches

No crossing branches or branches that cross the trunk.

No eye-poking branches (pointed directly at viewer).

First branch should be placed approximately 1/3 the height of the tree.

Succeeding branches placed at 1/3 the remaining distance to the top of the tree.

Branches go on the outside of the curves (No belly branches).

Branch caliper should be in proportion to the trunk. Branches that are thicker than 1/3 the trunk caliper will be too thick.

First branch should be left (or right), second branch right (or left), third branch should be back branch.

Branches should visually alternate, no parallel branches.

Branches should diminish in size and caliper as they ascend.

There should be space between the branches to 'Let the birds fly through'.

First and second branches (Left and Right branches) should be placed forward of the mid line to 'invite' the viewer.

First, second, and third branches are approximate 120 degrees apart, with the back branch not directly behind the tree.

Only one branch per trunk position, no 'wheel and spoke' or whorled branches, or bar branches (branches directly opposite each other).

Branches should create an outline of a scalene triangle with the apex representing God, the middle corner man and the lower corner earth.

Secondary branches should alternate left and right and follow the rules of main branch placement, except there should be no secondary branches moving up or down. This creates the foliage pad.

To create the illusion of an old tree, wire the branches down. Young trees have ascending branches. The branches near and in the apex can be horizontal or ascend since this is the young part of the tree.

Branches for cascades generally follow the rules for uprights, except that the trunk moves down.

In twin trees, there should not be branches between the trees which would cross the trunks. The outside branches of both trees create the triangle of foliage.

A jin should not be hidden in foliage.

Pots

The tree should be placed behind the mid line of the pot, and to the left or right of the center line.

The depth of the pot should be the caliper of the trunk, except for cascades.

Colored glazed pots should be used for flowering and fruiting trees and the colors should complement the flower color.

The width of the pot should be 2/3 the height of the tree. For very short trees, the width should be two thirds the spread of the tree.

Style of the pot should match the tree. Uprights without much movement should be in rectangular pots, informal uprights with a lot of trunk movement should be in oval or round pots. Massive trees should be in deep rectangular pots.

Culture

Soils should be uniform, not layered.

Fertilize full strength.

Water from above not by submerging; this will prevent the buildup of salts.

Increase humidity by using a tray of pebbles and water or by keeping the area under the bench wet, not by misting.

Remove most of the 'fines' from any soil mix, using only coarse particles.

Water when the plants need to be watered, not by a fixed schedule.

Keep temperate climate plants outside. Only tropical and subtropical plants (for the most part) are suitable for indoor bonsai. Temperate climate plants must be given an appropriate period of cold dormancy if they are to be kept indoors.

SUNLIGHT

Photosynthesis is a process used by plants to convert light energy into chemical energy that can later be released to fuel the plant's activities. This chemical energy is stored in carbohydrate molecules, such as sugars, which are synthesized from carbon dioxide and water – hence the name *photosynthesis.* In most cases, oxygen is also released as a waste product. Although photosynthesis is performed differently by different species, the process always begins when energy from light is absorbed by proteins called reaction centers that contain green chlorophyll pigments. In plants, these proteins are held inside organelles called chloroplasts, which are most abundant in leaf cells. In these light-dependent reactions, some energy is used to strip electrons from suitable substances, such as water, producing oxygen gas. In plants, algae and cyanobacteria, long-term energy storage in the form of sugars is produced by a subsequent sequence of light-independent reactions called the Calvin cycle.

Sunlight, especially the ultra-violet ray, affects the growth of trees. Therefore, except in special cases such as immediately after repotting, extensive trimming, etc., bonsai should be placed in a sunny location. Bright light will also work well but the tree should not be placed more than 12" away from the direct light source.

An east, west or southern exposure works best. A northern exposure will require the use of "grow lights" which should remain on up to 16 hours each day and the lamp should not be more than 2 inches from the top of the tree. Incandescent light is too hot and will not provide the various spectrum of light that is required to maintain your bonsai tree.

Bonsai need about 5 hours of direct or indirect sunlight per day. Certain species of bonsai do best in the winter if they receive most of their light from indirect sources. Bonsai trees can burn if taken from a shady location to a sunny location so care should be taken to gradually increase their light exposure.

If you do not have a window or light source that provides an east, west or southern exposure, be sure to select a bonsai tree that does well in lower lighting conditions.

NOTE: Remember to turn your trees frequently so that they receive light equally on all sides; otherwise, they will grow lopsided and limbs kept on the shady side may eventually die.

FERTILIZER

Q: Is fertilizer plant food?
It is not. Fertilizer is a substance that contains plant nutrients that are added to the environment around a plant. Usually, fertilizer is added to soil or water, but some fertilizers can also be sprayed directly onto plant leaves, or into the air. Although it is common for many fertilizers to be called plant food, this is not a proper description. Plants produce their own food, using water, carbon dioxide and solar energy. This food, which consists of sugars and carbohydrates, is then combined with plant nutrients to produce enzymes, proteins, vitamins and other things necessary to plant growth.

Q: What is N, P, K stand for?
N-Nitrogen is responsible for green color and new growth. Nitrogen is needed for cell division and the manufacture of protein.

P-Phosphorus is associated with good root growth and flowering

K-Potassium is associated with healthy cell activity.

Q: What is a balanced fertilizer?
When all the numbers N, P, K are the same it is called a balanced fertilizer and for most purposes, including bonsai, this is what you want for general overall health and growth.

Q: Is a 20-20-20 fertilizer better than 10-10-10? And what are these numbers stand for?
No, the directions for use take into account the differences in the percentages of dry weight. In other words you will use half as much 20-20-20 per gallon of solution as 10-10-10. These numbers represent the percentage of available nitrogen, phosphorus and potassium (N-P-K) found in the bag, so 12-8-10 fertilizers has 12-percent nitrogen, 8-percent phosphorous and 10-percent potassium. For most bonsai we recommend a regular application of low % fertilizer such as 5-5-5 or close to it. These low % fertilizers can be applied almost all year long. Higher % fertilizers can result in growth spurts or even burn the roots of our potted trees; That being said, sometimes in the late winter/ early spring many bonsaist are known to use a 10-10-10 on some trees to push growth. This should be done when you know how the plants react. Also, you will need to explore slow release verse fast release fertilizers. Bonsaist prefer the slow release organics compared to the fast release chemical varieties.

Q: What are Macronutrients and Micronutrient?

Macronutrients are chemicals that an organism needs in large proportion to live and grow. Nitrogen (N), Phosphorus (P) and Potassium (K) are macronutrients. Micronutrients are elements required by plants and bacteria, in proportionately smaller amounts, for survival and growth. Boron, cobalt, copper, iron, manganese, molybdenum and zinc are micronutrients. When the macronutrients are missing the growth rate for the plant will be reduced - sort of like vitamin deficiency in people. Many fertilizers now advertise that they contain micronutrients. We recommend choosing one of these over a "regular" version.

Q: When should I fertilize?

This is a tricky question. The key to knowing when to fertilize your plants is to understanding the growing cycle of plants. There are three stages: growth stage, fruiting stage and dormant stage.

- **Growth Stage** - when plants grow they require more nitrogen and phosphorous. Nitrogen encourages leafy growth and helps plants grow their stems and branches. Phosphorous is needed for seed germination and root development.
- **Fruiting Stage** - As a plant enters the fruiting stage it seeks out a generous dose of potassium. Potassium is needed because it helps plants produce fruit and flowers and aids resistance to disease and pests.
- **Dormant Stage** - As plant goes into hibernation they don't require much in the way of fertilizing. A dose of phosphorous will help to strengthen the root before plant goes to dormant. Thus we sometimes use a 0-10-10 in the dormant seasons to promote root growth.

Q: What kind of fertilizer should I use?

There are a lot of opinions about fertilizer in the bonsai world. For many people the simplest solution is to use a timed-release fertilizer like Osmocote. The advantage is that every time you water a bit of fertilizer will dissolve and feed your tree. But these fertilizers typically don't release fertilizer when the weather is cooler than 70-degrees, and release a lot of fertilizer when the weather is warmer than 90-degrees. So, when it's cool these won't do you any good - and you'll need another kind of fertilizer. And, when it's hot you run the risk of fertilizer burn - so you may need to remove some of the pellets in late summer. We recommend fertilizing beginning in late-February or early-March. For pines, after the candles are removed additional fertilizer should be added.

Pot Size	How Much Osmocote to Use
Small (e.g. 4" diameter)	2-3 teaspoons
Medium (e.g. 12"diameter)	2-4 tablespoons
Large (> 12" diameter)	4-8 tablespoons

The Osmocote package says that it is good for about 6 months, but in reality it doesn't last more than a couple of months when used on bonsai because we water so frequently. So, you'll need to need to replenish it every couple of months. For a quick boost of fertilizer some people use a diluted version of Miracle-Gro, or Miracid on pines and azaleas. Other people prefer to use fish emulsion - it's considered "safer" but it smells nasty and can attract slugs and wildlife. Osmocote has too much nitrogen to be used during the Dormant Stage. During this stage you'll need to use an alternative. We recommend:

a. For flowering, fruit, and berry producing trees: Use low nitrogen fertilizer (look for bulb and bloom fertilizer) or Seaweed extract when you water.
b. For deciduous trees: Apply 0-10-10, such as E.B. Stone Ultra bloom

Q: How much fertilizer should I use?
Younger plants, or those that you want to grow larger, will require more fertilizer (esp. nitrogen) than older trees that you are maintaining. But, a good rule of thumb is to use a tablespoon or two of Osmocote on trees in medium-sized pots (e.g. 12-18 inches long). Smaller trees might only need a teaspoon.

During the rainy season fertilizer will be washed out more quickly so it's a good idea to use extra fertilizer, perhaps twice the recommended amount of Osmocote. This is safe because low nitrogen fertilizers won't "burn" like too much Osmocote.

Q: When do I change the fertilizer?
With daily watering Osmocote pellets won't last more than a couple of months, so you need to occasionally look at the pellets and see if they are still full. The pellets you see are actually a plastic bead that contains the fertilizer. As the fertilizer leaches out you'll be left with an empty plastic bead. If you can crush the bead between your fingers then it's time to remove / replace them.

As mentioned above, when the temperature gets hot remove some of the pellets. And as the weather cools and trees enter the dormant stage remove the high nitrogen fertilizer and replace it with blooming fertilizer.

Q: Why are my leaves yellow? (chlorosis of leaves);.

Location of yellowing will point to problem.

- On all leaves – Lack of nutrients – fertilize
- On younger leaves – Lack of Iron or manganese
- On older leaves – Lack of nitrogen or potassium
- On leaf edges – Lack of magnesium and potassium
- Between veins – Lack of iron and manganese

Nitrogen deficiency will show up as up as chlorosis of the entire plant – leaves and needles turning yellow. Often this will show up on older leaves / needles first. A quick fix is to use a liquid fertilizer.

Phosphorus deficiency will cause a variety of symptoms that are difficult to identify. If the stem or underside seems to be purple, or you see gray or brown-netted veining then that's probably a phosphorus deficiency.

Magnesium deficiency may show up as chlorosis of the tip of needles. When the yellowing is seen primarily on new growth then it's probably an iron deficiency. For magnesium deficiency sprinkle a teaspoon of Epson Salt to the top of your soil. Because Epson Salt dissolves so quickly you'll probably need to do this a few times over a month. For iron deficiency sprinkle a tablespoon of Ironite over the top of your soil. This dissolves more slowly and one application may be enough.

For more information about how Nitrogen is used in plants, see the article - Nitrogen Cycle

Too Much Fertilizer

Just as too little fertilizer can cause problems, too much fertilizer can also cause leaf "burn". The classic symptom is dry brown edges of the leaves or needles. Of course leaves can also turn brown because the heat was too much and the tree wasn't watered enough. Once you've ruled those out, evaluate the amount of fertilizer on top of your soil. If it looks like a lot more than the recommendations above you may want to remove most of the fertilize for a week or two to give time for the excess to wash out of the soil and for the tree to begin to recover. Later you'll want to add some new fertilizer but keep the total amount less than what seemed to cause burning.

But, first check that the fertilizer beads actually have fertilizer inside. If they're all empty then you will want to remove the used up fertilizer and add new now.

Once leaves have burned they won't recover, so avoid too much heat and fertilizer and water appropriately to avoid leaf burn in the first place.

WATERING

Ii is said that more Bonsai die thru incorrect watering than any other cause, with the majority of those caused by “overwatering”. When the surface of the soil feels dry to the touch, water the plant until entire root ball is wet. DO NOT water again until the soil surface feels dry again. This can be as frequent as three times a day or as infrequent as every 3 days depending upon several conditions including time of year, plant health, and soil composition.

The question then becomes; is the soil bone dry, moist, wet, or soggy?

Bone Dry: “The complete absence of moisture in the soil”. While some plants such as sand pine, Japanese black pine, boxwood, and junipers like their soil a bit on the dry side, no plant can stand a bone dry condition for very long.

Moist: “Soil feels cool to the touch; is loose and crumbly”. This is the best and safest condition for most plants.

Wet: “The saturation point for granular soil; particles cling but separate easily.” Wet soil is appropriate for bog plants such as cypress, tupelo, and maple. If the soil remains saturated for long, there is a problem that must be identified. Either pot drainage is poor or the plant’s roots are not functioning correctly. Look for the issue and correct it.

Soggy: “The saturation point for muck, clay and other soils with small grain” Soil will pack into a solid ball when squeezed together. Soggy soil leaves no air spaces and plants literally drown.

Notes: After a plant’s foliage has been misted, the soil will feel deceptively moist; however, the soil underneath the surface may be dangerously dry. Be careful

Caution: If you allow your Bonsai to become “Bone Dry”, DO NOT plunge it in a pan of water and attempt to wet the entire root ball, instead lightly mist the foliage and place the plant in the shade until late evening. At this time you can return the plant to its normal spot and allow the morning dew to revive the fibrous roots along with the regular watering cycle.

*** Remember these 5 key points to watering your Bonsai.

1. A newly potted plant will use less water than an established one.
2. A plant in a small pot is to be watered with more frequency.
3. The larger the leaf, the more water the plant will need.
4. Hot sun or windy weather will necessitate the need for more water.
5. Less water will be needed in winter or during dormancy.

INSECTS & DISEASE

Bonsai trees are susceptible to both insects and fungus. This section will help you with both.

Identifying Pests

One of the things you need to do is see the pest that's eating your tree. You can use a magnifying glass, but a better solution is a 10-power loupe. You may think if 10-power is good, then a 15- or 20-power must be better, but that's not true. First the image will tend to shake more and they are just harder to use.

Many geologists recommend the BelOMO 10x Triplet Loupe. It's available from Amateur Geologist for about $32. If you'd prefer to order from Amazon, they also carry it - although it really ships from Amateur Geologist.

Insects

Aphids - In the spring aphids can be a real problem, especially on newly emerging maple leaves. Most of the ones we see are green (like in the following image) but some are dark gray / black.

Fortunately aphids are easy to get rid of by washing them off while watering. Simply turn the water pressure up a bit more than normal and spray the undersides of leaves. You may have to do this every few days but eventually the aphids will disappear. Insecticidal soap is very safe and effective. Or you can use one of the oil-based sprays.

Scale - Scale is an insect that lives under a hard shell. The shell may be black, white or other mottled.

Red spider mites often invade and ruin the color of pines and Shimpaku during hot weather. There are a variety of solutions. Red spider mites prefer a warm, dry climate. Increasing humidity thru misting and keeping trees well watered should minimize infestation. But when they strike you should quickly spray - either with miticides or one of the oil-based sprays. Remember to move sprayed trees to a shaded area for a week to avoid damaging the tree. These bugs have a very short reproduction period so you'll need to repeat the spraying two or three times at ten-day intervals, as the eggs will keep hatching.

Thrips - are another insect that feeds on the undersides of leaves. Thrips puncture the leaves, flowers, or stems and suck up the exuding sap. The first indication may be when fine yellow spots appear on the leaf surfaces. Later the foliage may take on a silvery appearance, eventually browning and dying. Leaf tips may wither, curl and die. The undersides of leaves are spotted with small black specks. Flowers become flecked, spotted, and deformed and many buds fail to open. This illustration below shows green thrips, but there are many varieties - and different colors. As treatment, you can use insecticidal soap.

Juniper Twig Girdler - This pest is a major problem for many club members. The real damage is done by the larva of a small moth. Oil-based sprays may not be effective on the larva. Pyrethrum spray may work better, and is fairly safe – except you need to avoid exposing cats, fish and bees. You need to spray twice - in early June and mid-July.

Fungus

In addition to insect control, bonsai can be attacked by various fungus diseases, like sooty mold, rust, etc. Here are a few common ones:

Sooty Mold

Rust

Mildew

Black Spot

For many years, Lime Sulphur was used for treating common fungus and insect infections. But Lime Sulphur is now illegal in some states. So when you need to treat fungus, a copper fungicide is the preferred choice. Neem Oil can also be used for Powdery Mildew, Black Spot and other fungus. Spray during the cooler months, or move your tree to a shady area for a couple of week after spraying.

Dormant Sprays

Although the colder weather of autumn and winter will kill off some bugs, like aphids, some will survive to attack our trees. It's important to continue treating for insects and fungus so spray trees after leaves drop.

In previous years, manufacturers sold a variety of different pest controls with names like dormant spray, summer spray, all-seasons, etc. This naming was supposed to help consumers know when to use the spray. Often the dormant spray, used when the leaves have fallen, would be a bit too harsh to use on growing leaves. But this seems to be less of a concern because the oils used in such sprays are more highly refined.

That brings us to choosing which type of spray to use. Oil-based sprays kill insects by smothering the bugs. Many are mineral oils (derived from petroleum) although some are vegetable oils (canola, cottonseed, Neem). Common product names are Ultra-Fine and Volk. Some literature suggests that cottonseed oil is a slightly better insecticide. But Neem oil may be even better because it also attacks fungus and bacterial infections.

Application

- *Never spray any tree that you plan to display in an exhibit within the next few weeks. The oil can change the color and shine of the tree and make it look unnatural.*
- *Check for soil dryness the day before spraying. The soil should be moist.*
- *After spraying move your trees to a shady area of your yard for a week or two, otherwise you risk damaging the leaves.*

MOSS BASICS

There are 12,000 species of moss. Moss commonly grows close together in clumps in damp or shady locations. Moss does not have flowers or seeds. The life of a moss starts from a spore. The spore germinates to produce a protonema, which is a mass of thread-like filaments. Moss absorbs nutrients it needs from the air or the ground and are found in areas of dampness and low light and are also found in cracks between paving stones in damp city streets. Mosses require moisture to survive because of the small size and thinness of tissues.

Cultivation of moss is a way to have different colors and textures of mosses. Of-course, it is easy to collect natural grown moss at any wet, damp areas when needed. There a several ways to cultivate moss using tray or bricks. Collected moss has to be slightly dry out enough to be easy to crumble and cut. Take a shallow container with small drainage holes and put a layer of sand into the bottom and mist until it is damp. Sprinkle crumbled or fine minced moss evenly on the surface of the sand. Mist it until it is damp and place in a dappled shade area and ensure that the top never dries out. It will usually require misting once a day. In a couple weeks you will have a sheet of moss. The other method is using a blender and bricks to start growing moss. Making the "moss-shake" by adding beer, buttermilk, or water with slightly dry moss clump in the blender and blend it to the consistency of thick milkshake. Place the bricks into a tray without drainage holes and fill the container with water; the bricks will act a wick constantly draw water up. Spread the paste on top of the brick and mist daily, in few weeks the moss will grow and eventually will create a solid carpet of moss. Applying moss to your bonsai is easy if care is taken. The arrangement, spacing, texture and color can be greatly enhancing the visual appearance.

There are many directions of how to apply moss on the web. One site (Bonsai of Brooklyn) is recommending “tenderizing” the moss sheet with the meat tenderizer using the side with the little spikes and applying the moss sheet to the bonsai. Or on Bonsai Tonight blog, moss is layered with additional damp white sphagnum moss and adding tiny soil, black lava particle over the moss gaps.

A simple guideline when applying moss:

- Leave spaces between moss clumps allow room for growth.
- Leave a space around the rim of the pot. This will enhance the overall of the presentation

Although moss is usually used to represent grass around the base of a tree, moss can also be used in accent plants - such as this moss garden.

BONSAI SOIL

There are many different soil mixtures used to plant bonsai. Bonsai people in Florida, Scotland, Holland, Japan, Canada and California all have different growing conditions and different materials available to make soil mixtures. Most mixtures have one thing in common -- they don't use garden soil. This is because shallow pots don't drain as well as soil in the garden and as a result the roots can stay too wet and rot!

Soil PH

Soil pH is a measure of the acidity or alkalinity of the soil on a scale of 0 to 14. Neutral is 7, while less than 7 is acidic, greater than 7 is akalai. Soil pH affects the amount of nutrients that are soluble in soil water and, therefore, the amount of nutrient available to plants. Some nutrients are more available under acid conditions while others are more available under alkaline conditions. Most deciduous trees (e.g. maples, elms) prefer soil that is nearly neutral – 6.5 ph. But conifers prefer a slightly more acidic soil, around 5.5 ph.

- **Akadama and sand are used for moisture retention. Akadama is slightly acidic**
- **Lava and pumice are used to improve drainage. Lava has an average porosity of 70-90% (depending a bit on type and size) and is listed as an inert material so no influence on pH values.**
- **Pumice has an average porosity of 90% and has a tendency to increase pH values slightly. It has the added advantage of weighing much less than lava. Pines and junipers prefer a slightly more acidic soil, so using Kanume (4.5 – 5 ph.) instead of pumice is recommended**
- **Turface is most commonly used as a soil additive to help improve drainage. Turface absorbs its weight in water while decreasing soil compaction, which is what you want from bonsai soil. So in that respect it acts like Akadama or Kanume - and is a lot less expensive. Many people successfully use Turface instead of Akadama**

Soil Size

The size of the particles used is important. For example, a mixture made with larger particles will drain faster than a mix made using smaller particles. A small pot will have less soil and tend to dry out faster than a larger pot. We can keep a small pot

from drying out too quickly by using smaller sized soil particles in the mix. The following table shows the size of particles recommend for different size pots.

Pot Size	Particle Size
Shohin (e.g. 4" diameter)	1/8"
Shallow (<1.5" deep)	1/4"
Medium (1.5" to 3" deep)	3/8"
Deep (> 3" deep)	1/2"

Soil mixture is made by first sorting the various materials (see tables below) into the proper size and then combining them. Sorting is usually done using a sieve. Sieves typically come with three screens that allow you to sort your materials into the proper size according to the table above.

Making Soil

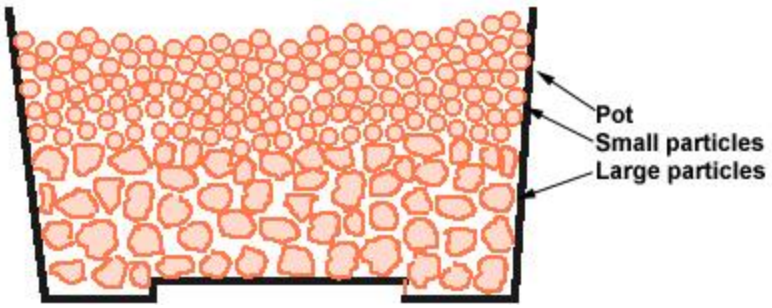
Here's the procedure for making a "soil mix." You'll be sifting each material three times. First, sift using the largest screen and keep the material that doesn't fall thru the screen into one pile or bucket. Now use the medium screen and again sift the material that went thru the largest screen -- keep the material that doesn't fall thru the screen into another pile or bucket. Now use the finest screen and sift again -- keep the material that doesn't fall thru the screen into a third pile or bucket. Only very small particles or dust will go thru this screen keep this dust to make Muck (described below) or discard.

Now that you have each of the components sorted into three sizes, combine them in the rations shown in the tables below

Material	Measures
Red & Black lava	2
Pumice	1
Calcined Clay	1
Expanded slate	1
Pine Bark	1

Putting Soil in the Pot

Generally you will put a shallow layer of soil in the bottom of the pot, put your bonsai in the pot and add the same size soil on top of the roots. When pots are deeper than 3" it seems to be valuable to use a layer of larger soil in the bottom to make the soil drain faster. This is shown in the figure below.



It is recommended replacing the top inch of soil once or twice a year. This gets rid of weeds and salt build-up. Simply use a chopstick or small rake and gently rake the surface over the edge -- be careful not to damage any roots. Then put fresh soil on top and use a chopstick to settle it in around the roots.

Muck

Muck is another important "soil" mixture. It is a paste that's used as a binding agent to hold soil or objects such as rocks stable in the pot until the tree roots are established. When we use a rock slab (e.g. slate) instead of a pot, we often use Muck to create an edge that will prevent the soil mixture from sliding off. To do this, roll muck between your hands until it looks like a rope, perhaps 1/2 inch in diameter. Then lay the rope on top of the rock slab and arrange it until you like the shape. It usually should be irregular in shape. Now press it down until it sticks to the rock slab. Now add your trees and soil mixture.

Recipe: Sift adobe soil, keeping only the fines (dust to 1/8"). Use a screen that's the same size as window screen or slightly smaller). Some peat moss is long and fibrous. If this is yours, cut it using scissors into lengths approximately 2" in length. Now mix half adobe and half peat moss. Add just enough water that it can be kneaded to a dough-like consistency. It's easy to knead if you put the mixture into heavy-duty zip lock bag.

Hint: If you can acquire black adobe that will make the best looking muck, but it's difficult to find. In fact, depending on where you live any kind of adobe soil may be difficult to find. If you are using Akadama in your soil mix you are probably throwing away the dust when you sift it. Don't -- use it in this recipe instead.

Storage: If you have any left over, store it in the zip lock bag in your freezer. (Yes, your freezer. This will keep it from becoming moldy.) When you need it for your next project just remove from the freezer, let it thaw, add a bit more water if needed and then knead it a bit to get it flexible and ready for use.

The soil recipe described works in the micro-climates around Orlando, Florida. If your weather is warmer or cooler than Orlando then you'll need to modify the mix slightly.

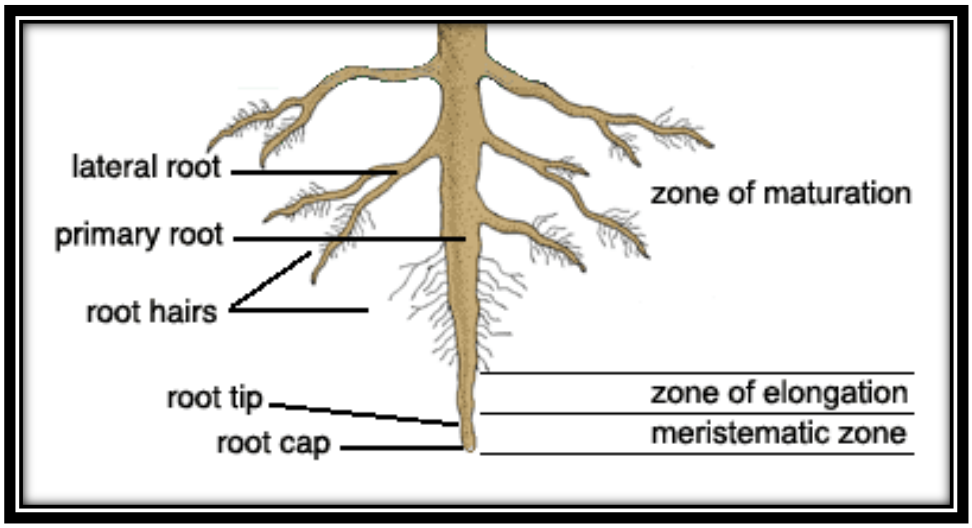
TREES 101

Bonsai artists combine horticulture knowledge with artistic flair in order to produce the trees you see in Bonsai magazines, competitions, Internet and even at local bonsai clubs. An elementary level of plant familiarity will assist the aspiring bonsai artist in understanding how to better care for their trees.

Roots: The root system of a plant constantly provides the stems and leaves with water and dissolved minerals. In order to accomplish this, roots must grow into new regions of the soil. An important biologic functionary of the tree root system is the tiny, nearly invisible root "hair". Root hairs are located just behind the hard, earth-probing root tips that burrow, elongate and expand in search of moisture while at the same time building a tree's ground support. Millions of those delicate, microscopic root hairs wrap themselves around individual grains of soil and absorb moisture along with dissolved minerals.

A major soil benefit occurs when these root hairs grab soil particles. Gradually, the tiny roots reach out to so many particles of earth that the soil becomes firmly tied into place. The result is that soil is capable of resisting the erosion of wind and rain and becomes a firm platform for the tree itself.

Interestingly, root hairs have a very short life so the root system is always in expansion mode, growing to provide sustained maximum root hair production. To take full advantage of finding available moisture, tree roots run shallow with the exception of the anchoring tap root.

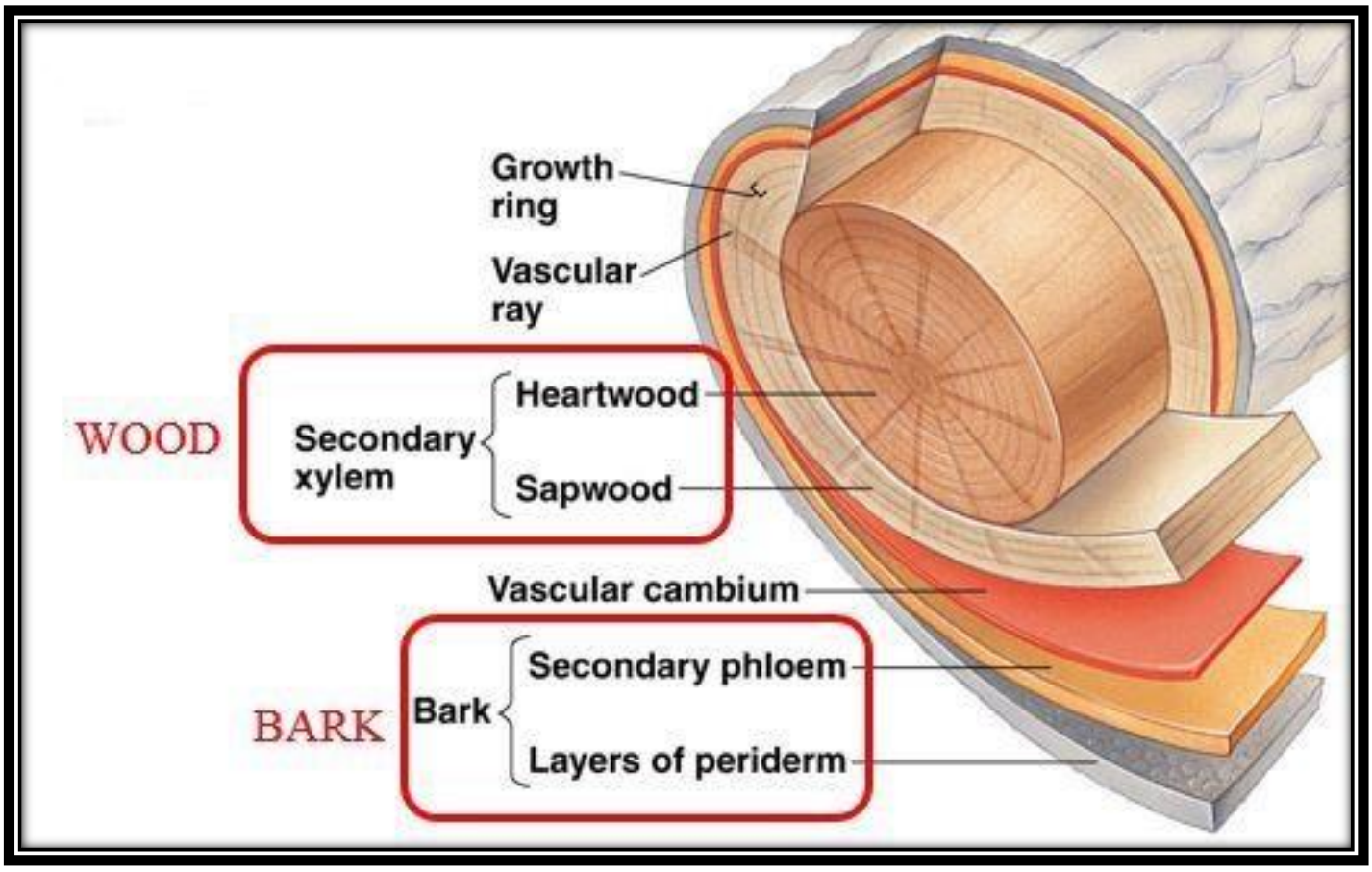


Root Structure

Trunk: A tree's trunk is critical for limb support and root-to-leaf nutrient and moisture transport. The tree trunk has to lengthen and expand as the tree grows in its search for moisture and sunlight. A tree's diameter growth is done via cell divisions in the cambium layer of the bark. The cambium is comprised of growth tissue cells and found just under the bark.

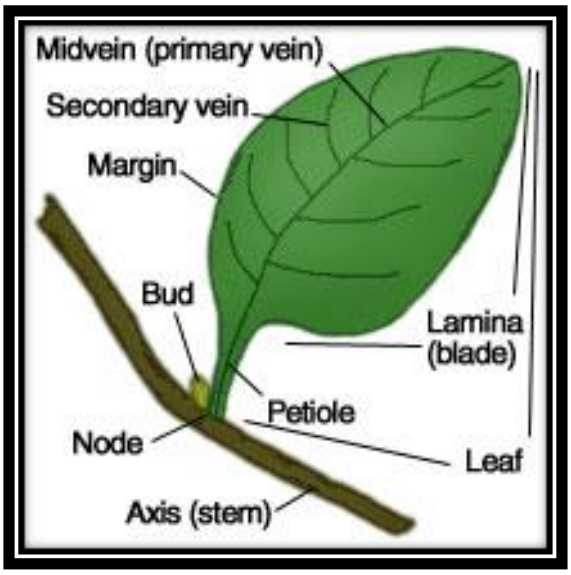
Xylem and phloem cells are formed on both sides of the cambium and continually adding a new layer each year. These visible layers are called annual rings. Cells to the inside make up the xylem which conducts water and nutrients. In xylem cells the fibers provide strength in the form of wood; the vessels allow water and nutrient flow to the leaves. Cells to the outside make up the phloem, which transports sugars, amino acids, vitamins, hormones, and stored food.

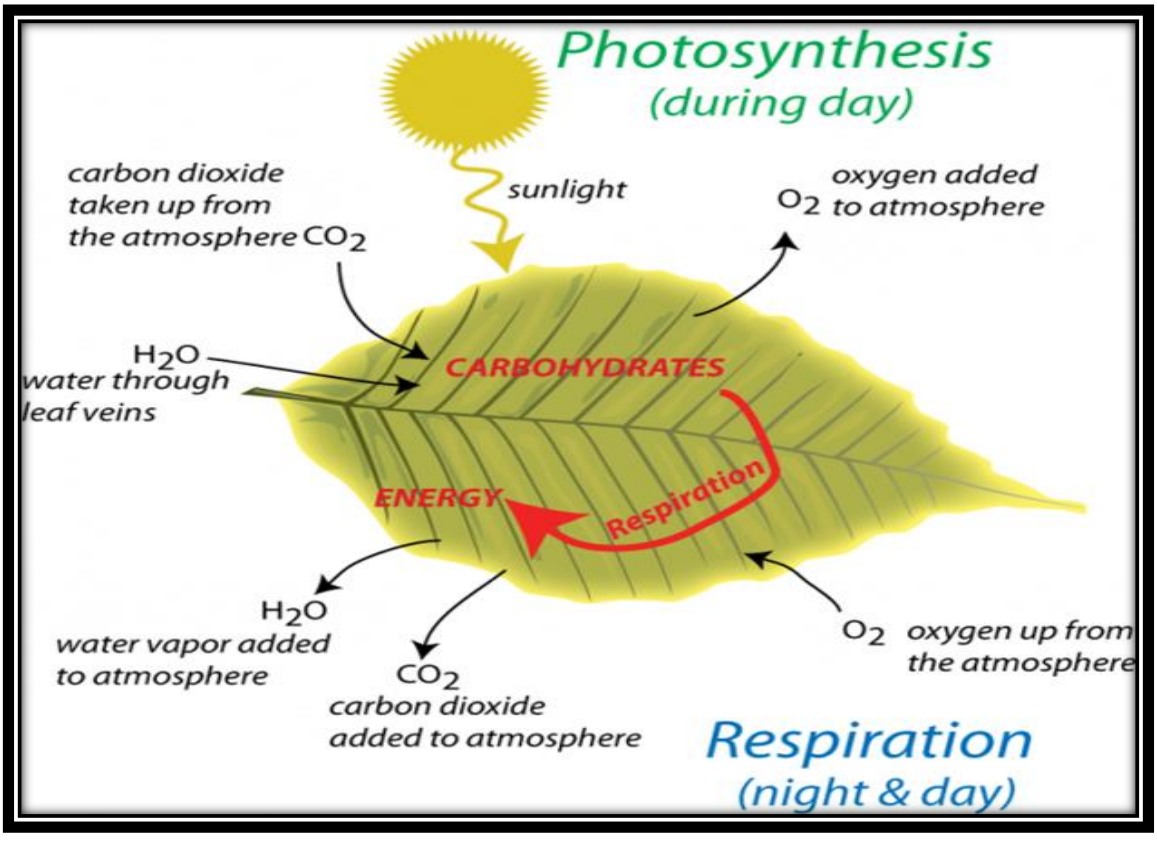
Trees ultimately deteriorate and die due to damaged bark from insects, pathogens and environmental damage. The condition of a tree's trunk bark is one of the most important factors affecting a tree's health.



Sections of the trunk

Leaves/Photosynthesis: Photosynthesis is the process by which plants use light energy to convert carbon dioxide and water into sugars. The sugars produced by photosynthesis can be stored, transported throughout the tree, and converted into energy which is used to power all cellular processes. Water is absorbed from the soil into the cells of root hairs. The water passes from the root system to the xylem vessels in the stem until it reaches the leaves. Carbon dioxide is absorbed from the atmosphere through pores in the leaves called stomata. The leaves also contain chloroplasts which hold chlorophyll. The sun's energy is captured by the chlorophyll. Leaves are essential for the well-being of plants. Most of the reactions involved in the process of photosynthesis take place in the leaves.





GROTH PRINCIPLES

1. Plant growth will move in the general direction of the strongest available light. Trees can easily be shortened by cutting the trunk back to a healthy side branch. The new leader will eventually assume the natural upright position. Leader direction can be altered by use of bonsai wire. To shorten a side branch, cut back to a bottom twig or bud. As it grows toward the sun (which comes in from the side), the natural branch configuration will be maintained.
2. The more healthy leaves a plant carries, the faster and stronger it will grow. Ideally, lower branches will be the oldest and largest with others becoming progressively younger and smaller nearing the apex. By allowing weak lower branches to grow overly long and carry extra growth, while keeping the stronger upper branches cut back tight, this ideal can be gradually realized.
3. When the extreme twig tip is removed, available food will be diverted to other growing tips and buds. Whether you remove four inches or just the tips, the persistent and judicious use of this principle places at your command the power to completely control the tree's development. The time, place, direction, and rate of growth in the entire plant, will be determined by the number and location of growing tips and food producing leaves.
4. A growing plant's survival ability without photosynthesis is directly related to the amount of food contained in the pith rays at the time. Pith Rays are special cells used for transporting fluids and storing food. Excess sugar is stored here for use when leaves are unable to manufacture enough for the tree's immediate needs. Use extra caution in pruning a plant whose storage cells can reasonably be expected to be empty due to leaf drop resulting from root damage, shaded following root pruning, or a recent bout with insects or disease which has damaged the leaves.
5. Deciduous trees rely on food stored in the pith rays for energy needed for spring growth. Attend to all drastic pruning in the top of the tree during the dormant season. All stored food will then go to the production of desired growth. Collect or root-prune just as buds are beginning to show green in the spring. Sugars will be moving up through the tree and will no longer be in the pith rays (some of which are located in the roots). Deciduous trees will become more "twiggy" and produce smaller than normal leaves if they are forced into a "second spring". Do not attempt this unless you are certain the tree is healthy and strong and that it has been allowed sufficient growth to replenish its storage cells. Also be certain it will have time to fill them again before another dormant season.

6. Root growth will take the route of least resistance in the general direction of the nearest source of nutrients and water. Roots anchor the tree to the ground and hold it upright. They contain all of the same layers as the trunk sand branches except bark which disintegrates in the moist soil as fast as it forms. The also respond to pruning in the same manner as limbs and twigs. Root tips are small "feeder" roots which do the entire tree' searching for nutrients and water. Each root tip has a protective cap that is pushed ahead as the root tip grows and thousands of microscopic root hairs which probe for and pickup nutrients and water from the soil. As root tips grow and mature, or when the root cap ia injured or encounters an obstacle which hinders its forward movement, root hairs begin to extend themselves becoming root tips with root caps and microscopic root hairs of their own. Soil type and size as well as direction of top growth provide valuable clues to the location of feeder roots. Use these clues when collecting to determine the location of the root ball which will have to be dug. Provide a soil which will encourage the desirable root development. Smooth soils offer little resistance thus encouraging rapid root growth and the development of fewer, but larger roots. Granular sols encourage root ramification and the development of more feeder roots.
7. Root ramification can be artificially induced by pruning. Lift and expose large surface roots (they will develop bark) to give the tree a look of stability. Then cut them back sharply just below the soil surface to reserve pot space for the more efficient feeder roots. This may be accomplished over a period of years instead of in one step. Keep roots "forever young" and increase their efficiency by periodic, judicious root pruning and re-potting in fresh, viable soil.
8. A plant will divert food to flower, fruit, or seed production at the expense of new foliage. Do not allow this if the plant is weak.
9. Under extreme stress, a tree will kill off a part of itself. Keeping the tree healthy ensures that you will be the one who decides which parts live and which parts will need to be sacrificed.
10. There is a distinct inter-relationship between top growth and root growth; not only to size but also as to direction. Top pruning reduces the demands for raw products from the roots while root pruning reduces the demand for food from the leaves. The tree will remain healthy and small as long as balance is maintained.
11. A tree's growth habit and general adult shape is dependent upon its species. (genetic blueprint) Never attempt to style a tree in a manner which is totally alien to its nature, the tree will fight you forever. Those who are best at styling have studied trees as they exist and grow in nature as well as how they respond to various environmental pressures.

THE FRONT

A Theory of Style

There are a lot of things to take into account when you start to style your tree. While there are many additional elements of style that feed into this one, finding a front for your tree is certainly the most important and the first decision you must make in styling your tree. When we talk about finding the front, we're basically making a decision as to which side of the tree will be viewed as the front. If the tree were to be displayed, this would obviously be the side facing away from the wall and towards the audience. Choosing a front is a pivotal step because you will style your tree around the intended front.

As with any choice you will have to make with your trees, there will most likely be several options, each with their good and bad points. I think a good lesson to learn here, as well as with bonsai in general, is that it's not important to make the "right" choice. What really matters is making the path you choose the right one. In theory, you could choose the best side and consequently still make a less than ideal tree with your other style choices. Or you could choose a less ideal angle and end up styling cohesively with your decision and make a great tree. I believe the adage goes "the whole is greater than the sum of its parts" and as such, decisions that work together will yield a better product than ones that are individually best.

Below are some rough guidelines to use when determining the front of your tree:

1. On the front of the tree, the bottom third of the trunk will likely have no foliage covering it. The idea when styling the foliage is to create a window of sorts to see through part of the tree. This enables viewing of some of the interior structure year around, and also allows you to see through the tree to the back limbs creating depth. When choosing a front, any limbs in this section pointing toward the viewer will have to be removed.

2. One aspect to consider for the front of the tree is to arrange it at an angle that highlights the trunk. The front should be the view that you feel is the most interesting view of the trunk as a whole. The trunk should always (even if the inclination is slight) flow away from the viewer. By this I mean that wherever the trunk emerges from the ground, its angle should be pointing away from the viewer. What this does is helps open the tree up.

By initially tilting the trunk away from the viewer, it positions the bulk of the tree in the ideal focal point to be viewed at. It's inviting, if the trunk were to lean forward first it would feel as if the tree were pushing you away or trying to hide itself.

3. The main branch defines the movement, direction, or inclination of the tree. The main branch is usually (but not always) the largest and first branch on the tree as you come up the trunk from the ground. If your main branch is pointing to the right, then the inclination or movement of you tree should be to the right. This obviously doesn't mean that your trunk can only twist to the right or all your branches must go this direction, but it does mean that the overall feeling or movement of your tree should be consistent with the feeling or movement of the main branch.

4. The apex will always tilt slightly forward and should never be in conflict with the main branch. The apex or top of the tree should always be inclined towards the viewer. It should also point, if ever so slightly, in the direction of the main branch. This builds a uniformity of style throughout the tree and a congruency between the beginning (base of the trunk) and ending (apex) of the tree. Having an apex that points toward the viewer helps to create the image of bowing, as if the tree is inviting you to come in closer for a good look.

5. Determining the front of your tree will likely also make you evaluate the planting angle, or the angle at which the tree sits in the pot. Changing the angle that the tree is planted at can sometimes be a crucial consideration in the design and is generally used to accentuate or increase a certain feeling of the trunk or tree's style in general. A tree with a large curve in the trunk, for example, could change the planting angle to increase and highlight the curve or alternatively down-play it if the curve seems too overbearing. I believe it was Ryan Neil who made the point that planting angle or planting position should not be used as the primary way of putting movement in a tree. "A tree's movement should be developed in the trunk and limbs, not based solely on how it is stuck in the pot"

6. You must think of your tree 3 dimensionally. You want to create a pleasing rounded canopy, so it is important to build you tree with not only the front in mind, but also the sides and back. While any display will feature a predominant view from the front, the sides and back of the tree will not be completely hidden. It's also important to make sure there are no branches (except perhaps at the apex) that point directly toward the viewer. Additionally branches should never cross one another or the trunk. You will need to style you tree in such a way that each foliage pad occupies its own space. If it helps, think of the foliage design in the front as hugging the tree. Branches will come in from the sides and use the very tips of the foliage to obscure the trunk.

Obviously what I've constructed here is not a complete picture of bonsai style. What I wanted to do was help to give the beginner some things to think about before cutting into their first tree. If you're taking on the task of styling your first tree, I would encourage you to seek out as much info as possible before hand. However, most things in bonsai you just have to practice.

One thing to think about that was lost on me the first time I styled a tree was the idea that the tree will not be completed after this styling. I suppose this concept is obvious and in actuality I understood it on a very basic level. But what I'm really trying to get at is that you need to think of your trees development as being on a scale of 100-0. The completely un-styled tree will be worth 100 because it is full of potential. As we work on our trees we will slowly be removing its potential final designs, and hopefully be narrowing to a final design. The perfect tree will be a 0.

Through our styling process we will be dividing the possible outcomes of the tree. For example, if my first decision is to make an informal upright styled tree, I will be dividing out the billions of possible final trees that do not include the informal upright design. If I remove a limb I will likewise be removing any possible designs that included that limb. The first styling of the tree is crucial because we will divide out the largest portion of the tree's theoretical futures. If you are good at styling your tree, you may remove something like 70% of the possible future styles.

With each additional pruning, styling, and re-potting we are slowly but surely narrowing the possible outcomes. Let's say for example on our next styling we narrow the possible futures by something like 1%. Than on the spring defoliation, we narrow again by .5%. The process will go on essentially into infinity because the number that we have, can be divided infinitely. The goal is always a 0 tree, but it's a goal that can never be achieved. When you see ancient trees that have been meticulously cared for over centuries, you will be astounded by the incredibly intricate twists and turns. This can only be achieved by thousands of choices made over a very long time.

It's often said that the pinnacle pieces of any variety of art have a "quality" about them that is not easily explained. I believe that the greatest artists are the ones that can come to a resulting piece by this process of careful negative selection. The most successful way to create a piece of art is perhaps not by choosing what it might be, but by choosing what it will not be.

CARE OF YOUR TREE

BEFORE BONSAI TRAINING

The drastic top and root pruning required to transform an ordinary plant into a Bonsai are a shock to the plant which may result in its death. The steps outlined below will increase its chance to survive.

1. REMOVE EXCESS SOIL ABOVE THE LEVEL OF SURFACE ROOTS. Excess soil around the base of the trunk is bad for the plant.
2. CHECK PLANT FOR SIGNS OF INSECTS OR DISEASE AND TREAT ACCORDINGLY. Do not attempt to train your tree until you are certain it has regained its health and vigor.
3. MAKE CERTAIN YOUR PLANT IS NEVER ALLOWED TO BECOME "BONE DRY". Small feeder roots so necessary for its survival would be irreparably damaged.
4. FERTILIZE REGULARLY DURING THE GROWING SEASON. The amount and type is dependent upon individual circumstances and personal preference.
5. APPLY A SPECIAL BOOSTER APPLICATION OF FERTILIZER APPROXIMATELY THREE WEEKS PRIOR TO TRAINING. A great deal depends upon the plant's inner strength. (Dormant deciduous trees are the exception.)
6. IN THE 24 HOURS IMMEDIATELY PRECEDING PRUNING AND WIRING ALLOW THE SOIL TO BECOME SOMEWHAT DRY. The trunk and branches will be more pliable and less likely to be damaged or broken during wiring.
7. SAME AS (6) IMEDIATELY PRECEDING ROOT PRUNING AND POTTING. Dry soil is more easily broken up with less resultant damage to tender roots.
8. PREPARE A PLACE FOR YOUR NEW BONSAI. The exact best location depends upon the particular species of the plant in question and local circumstances.

Consult your instructor or research the tree's needs on your own.

CARE OF YOUR TREE

IMMEDIATELY FOLLOWING DRASTIC PRUNNING AND POTTING

1-Use soil which is only slightly, but evenly moist (cool to the touch); Since fibrous roots become dehydrated during the cleaning and pruning process, resist the temptation to saturate the soil immediately after potting. Instead mist the foliage and place in shade.

2-The following morning water thoroughly with a Superthrive solution (10 drops to a gallon of water)Place the tree in a temporary location where it will receive good light and air circulation, but be protected from direct sun, strong winds, or freezing weather. Avoid moving it unless absolutely necessary.

3-Mist the foliage several times daily, water as needed, and observe carefully for:

Signs of stress: (Water weekly with Superthrive.) wilting or leaf drop on broadleaf plants, Limp, dry looking foliage on evergreens, browning buds or twig tips.

Signs of new vigor: (Begin hardening off.)New buds on broadleaf plants show green. New light green growth on evergreen; Soil suddenly seems to dry out faster than usual - a certain sign that new roots are functioning.

4-Hardening off (a gradual return to normal); Begin exposing the tree to some direct sun in the early morning, gradually increasing these periods of direct exposure until the plant is receiving its full quota. If signs of stress are noted, back exposure time up somewhat, but do not return to complete shade. Wait a week and try again.

5-If you have successfully nursed your tree through its first three months in Bonsai, CONGRATULATIONS; chances are it will live to a ripe old age.

6-If you failed; examine the exact circumstances, seek help in analyzing the reasons for its demise, learn from the experience, and TRY AGAIN!

WIRING

Thoughts on Bonsai Wiring

by Jack Wikle

Attitude . . .
Get some wire and experiment. If you are wary of wiring your bonsai, try branches from your yard. Don't wait until you are sure you can do it right. This is one of those "creep before you walk and walk before you run" kinds of activities. You are not going to become comfortable with wiring by watching someone else do it --- kind of like learning to drive a car. Remember, if less than perfect wiring killed most trees, there would be far fewer bonsai on the earth even in the Orient. Allow yourself time to consider options and enjoy the process. Bonsai wiring isn't a race unless you make it a race.

Why spiral wire? . . .
Yes, bonsai can be created without wiring. A lot of repositioning of trunks and branches can be done by using "spreaders" and guying with cord or wire. However, spiraled wire can be an extremely useful tool giving the bonsai grower far greater control and offering more options in changing branch directions and creating pleasing curves. Aesthetic gain is often as simple as wiring outward jutting branches down; and, in the process, bringing the foliage at the ends of these branches closer to the trunk of the tree. This narrowing of the tree's silhouette makes the tree's trunk seem larger and more impressive. As an alternative or as a supplement to swinging branches down, trunks and branches can be shortened significantly, again bringing foliage closer to the soil or trunk, by using wire to introduce curves.

Demonstrate this to yourself by cutting a six or eight inch length of straight wire; then give it a curve or two by snaking it back and forth a bit. You will see that now the distance between the cut ends is considerably shorter. Of course, extreme bending approaching the spiraling of a pig's tail can have the impact of extreme compression of tree height, branch length and foliage mass. On wood that is not too mature and stiff, spiraled wire can make possible repositioning upper branches by twisting the upper part of a young tree's trunk far enough to swing a branch 180 degrees from right to left, or vice versa, literally putting it on the other side of the tree. In another situation, spiraled wire can make possible the shortening (and broadening) of your tree's top by swinging down its original leader and lifting up a lower and shorter side branch making it the new leader.

Furthermore, wiring can be used to control strong growth of overactive parts of a tree. Wiring alone will reduce growth of the wired part, but lowering limbs away from vertical toward the horizontal and even farther will have increasingly greater impact the farther down the branch is moved in slowing growth of the lowered part. So, wiring can be a useful supplement to pruning in limiting growth. It has even been suggested that wiring can help in promoting flowering on reluctant trees.

Thinking ahead . . .

Conifer vs. deciduous; there are some differences. Ernie Kuo quotes Mr. Wu of Hong Kong, saying in effect, wire and bend the conifer to the form you like and prune the deciduous tree. The broad pattern is that conifers tend to be more pliable and tolerant of bending, even of fairly mature wood, than deciduous trees which become increasingly brittle and intolerant of bending as they age. Moreover, most healthy deciduous trees can be cut back to interesting stumps with no foliage remaining and they will recover. This is in sharp contrast to conifers on which branches usually die if all their foliage is removed. Keep in mind also that wiring is a stress that the tree must use energy reserves in recovering from. Do little or no wiring on a weak tree. Get it healthy first. Then consider how much other stress such as heavy pruning, potting or repotting you plan at the same time. The Japanese say heavy wiring and repotting at the same time are very dangerous. Wait a year between major stresses. Letting brittle-wooded trees such as azaleas dry out a day or two before wiring is often recommended. This makes the branches more flexible. But caution is urged to not allow drying to the point of injury. Keeping the plant out of wind and direct sun after it begins getting dry will help.

A thorough cleaning before beginning any extensive wiring will make the work much easier. Eliminate all dead foliage, weak growth not essential to the tree's design --- the weakest branches never get strong --- and on pine trees pull off all needles more than a year old (again, the exception would be on weak growth you really need). This is also a good time to get rid of any misdirected growth --- perhaps underneath a branch or shooting straight up --- that can't be redirected in a useful way. Exercising, repeated flexing, of difficult to bend wood to soften it up before applying wire is often recommended by people with a lot of experience. This can mean five to ten minutes or even more of massaging heavy wood. At the extreme, this can also mean twisting the branch to be bent

Timing. . .
In more temperate climates, such as much of Japan and California, wiring can be done almost year around on most species. In Japan, pine wiring is limited to the dormant season --- first fall color to first cherry blossoms --- according to Joe Harris who acquired a lot of experience there as a bonsai apprentice. In our climate, repotting season ("when the sap is rising," after the ground has thawed and before new shoots are emerging) is prime time for wiring also. As with repotting, the worst candidate for wiring is the tree supporting a lot of soft growth. Because winter cold and frozen soil bring significant stress to all plants, late season wiring without allowing recovery time before freezing begins is best avoided. An exception would be any tree wintered where its soil will not freeze. So, our late season window of wiring opportunity is approximately August through September. For many quick growing, brittle-wooded species such as azalea, maple, wisteria, crabapple and ginkgo, a good time for wiring to set new shoots at a pleasing angle and to slow shoot growth, is late June to early July when leaves are almost full size and the new shoots are beginning to stiffen but not yet extremely brittle. When leaf pruning (defoliation) is done in June on maples, wiring just after defoliation can work well.

Copper vs. aluminum wire . . .
Both copper and aluminum wire have been much used in bonsai wiring and both have their supporters and detractors. Well-annealed copper wire is soft enough to apply comfortably then when flexed, it "work hardens" (the result of disruption of its crystal structure) giving it holding power well beyond its original strength. This stiffening can be a great advantage in doing the heavy bending that is possible on conifers.
Because aluminum wire is softer and does not work harden like copper, larger diameter wire is required to produce the same holding power. Accordingly, it has been most popular in doing lighter wiring, especially on soft-barked trees like maples and azaleas. Note that the Japanese often recommend wrapping wire by spiraling strips of light paper around it as protection for the bark of sensitive plants.

Wire thickness . . .
Many guidelines have been suggested but the best approach seems to be to try flexing the trunk or branch to be bent; then flex the available wire and choose wire that offers more resistance than the tree. In doing this, keep in mind that using wire a little heavier than you really need, will always work better than using wire not strong enough to hold things where you want them. Of course, if the wire you used wasn't strong enough, adding another wire or two parallel and close to the first will often work. When necessary, don't hesitate to add a guy wire, attached by securing it to a branch wire, to hold the wired branch in position.

Wiring sequence . . .
The usual procedure is "to follow the way a tree grows." Wire the trunk first starting at soil level then work upward toward its tip. Wire branches next starting with the lowest and heaviest. Then do secondary and tertiary branches. Finish with fine wiring of branch

tips and the tree's apex. Note that, stated simply, all this means is that the thickest wire is applied first, then next thickest, etc. and the thinnest wire is put on last in the refining stage.

How long do you cut the wire? . . .
For some of us it seems difficult to accept the inarguable reality that you can cut a too long wire short but you can't cut a too short wire long; cutting the wire at least a third longer than the distance to be wired will save time and wire.

Adequate Anchoring . . .
This is one of the biggest challenges in wiring. Basically the issue is securing one end of a wire, in such a way that it doesn't slip or shift as the wrapping continues, before coiling the rest of it into position. This can be as simple as wrapping an end of the wire around a branch stub or the base of another branch. In wiring a tree's trunk, the end of the wire is usually thrust straight down into the soil at the tree's base so its roots will prevent unwanted movement. But, by far the most effective way of anchoring branch wires is to use one wire to wrap two branches, one end being spiraled out one branch and the other end --- after a complete wrap (or two if possible) around the trunk --- being spiraled out another branch needing the same size wire (see Figures 2 through 6).
A useful technique when there is no obvious way to handle a branch either with a wire secured in the soil and making a pass or two around the tree's trunk, or using the end of a wire from another branch, is to use doubled wire to do the isolated branch (see Figure 9). Cut wire twice the length you would normally use. Bend it double. Start with the bend behind the trunk (away from the branch) then wrap both ends outward and parallel on the branch possibly using one end to do a secondary branch. In many cases, particularly when continuing with thinner wire after using heavier wire part way out a branch, the end of the lighter wire can be secured by passing it through any large enough gap between the heavy wire and the branch. A couple of other --- much less used --- anchoring techniques involving catching the end of a wire under the next wrap or two being applied are illustrated in Figure 10.

The spiraling process . . .
Practice holding the last wrap of wire with the thumb and forefinger of the left hand while "pushing" the next wire coil into place with the fingertips of the right hand. The "free" fingers of the left hand are also used to separate twigs and foliage as needed to make way for the wrap being applied. (The hands are reversed of course in doing left-handed wiring.) Every time the wire passes beneath the branch, advance the left hand. Imagine coiling a garden hose. Your goal is to wrap the branch without putting pressure on its bark. So you are trying to put a curve into the wire --- by giving it a slight twist and "pushing" it (back toward the base of the branch being wired) as you work --- before it makes contact with the branch. Visualize slight back pressure that tries to compress rather than stretch the wire being applied while rotating the wire at the same time. Twist the wire clockwise if wiring clockwise; twist the wire counterclockwise if wiring

counterclockwise. If you find this twisting or rotation of the wire difficult to picture, try imagining the unused wire as a snake with a long, narrow stripe running the length of its back. Then realize that what you do with the wire as you wrap it is like twisting that snake so that its stripe becomes a spiraling line. You will find this spiraling process much easier if you work with the branch being wired pointed almost directly toward you.

How tight is the wire wrapped? Again the goal is to lay the wire around the branch without pressuring it. The Japanese say leave enough space to allow a strip of rice paper to slip between the wire and the branch. Obviously, there will be contact at the pressure points when a branch is bent. My sense is that leaving extra room between the wire and the branch, as Kathy Shaner (a lady who spent more than five years in Japan as an apprentice to a well-known bonsai master) has shown us, is far better technique than tight wiring. An important reminder here regards applying "passing" wire (wire continuing along the trunk or parent branch past a branch that will be wired later with another wire). Being consistent in laying the passing wrap on the surface of the trunk directly opposite the location where the branch is attached will make it much easier to add the smaller wires – parallel to the large wire – and to run them out the laterals without a lot of crossing wires (see Figure 11). Experiment a bit with this approach using a branched stick from your landscape and you will discover that it gives the wirer great freedom. A secondary wire wrapped parallel to the passing wire can easily be wrapped around the passed branch either clockwise or counterclockwise. In other words, the wirer can choose wrapping direction depending on the direction the branch is to be moved.

Don't be intimidated by absolute-sounding angle of wire application guidelines.
Think about it this way. Tightly laid wraps, each loop lying against its predecessor, are obviously undesirable for a lot of reasons. Straight wire lying along the branch without passing around it won't work either. So, it is something between these extremes that will work. That is what the 45 degree guideline so often quoted really represents: an angle between 0 and 90 degrees. As Keith Scott once said, "I really doubt the person I see measuring wire angles will be the world's next great bonsai artist." Kathy Shaner puts it this way, "Good wiring in Japan is not 45 degrees, it's a much broader angle, about 60 degrees." My impression from Kathy and others is that the real strength, real holding power, of wire comes from wire put on along the branch rather than around it. Looking closely at Kathy's work, what I saw were wires laid almost as close as one could come to straight wire and still have it go around the branch. David De Groot's observation that a wiring "pitch" (distance between wraps) of three to four times the diameter of the branch being wired seems right on target. Other authors point out that to make sharp bends wraps will have to be close to a 45 degree angle but a 50 to 60 degree angle is fine for soft curves, and that making turns of wire closer together the closer you get to the branch tips works well. Try to bring a wrap of wire over the "elbow" of any anticipated bend. The goal here is to support the bend with wire laid across the point of greatest stress. Or, make it your aim to bend beneath a wire wrap so the likely breaking point is supported.

Whether the spiraled wire is wrapped to the left or to the right does make a difference. Whenever possible in wiring a branch that you will be moving ("swinging") laterally (and perhaps raising or lowering at the same time), your work will be easier and more effective if the wire is wrapped in the direction that is opposite to the direction the branch the branch will be moved. Simply stated, spiral the wire to the left to swing the branch right, and spiral the wire to the right to swing the branch left. The effect of doing this is that the wire tightens rather than loosens as the branch is moved. (In those cases where the base of the branch will be moved one direction and its end moved back the other way, be guided by the anticipated movement of the normally heavier wood at the branch base.)

Confused? Find two similar sticks. Wire one wrapping clockwise and the other counterclockwise. (See Figure 1.) Confirm for yourself that these two wraps are fundamentally different. Though this is counterintuitive for many of us, there is no way these wired sticks can be made to match by rolling one over or flipping one to switch its ends. Now, experiment in bending your wired sticks. You will find yourself almost instinctively twisting each stick as you bend it and you will twist in the direction the wire is wrapped – the direction that tightens the wire and swings the free end of the stick away from the wiring direction. Actually, if your wire is thick enough and your stick is long enough and thin enough, you will find that more and more bending tends to force it into a pig's-tail-like spiral. (Imagine yourself using wire to put the twists in real pigs' tails. You would wrap clockwise produce a clockwise spiral and wrap counterclockwise to achieve a counterclockwise spiral, wouldn't you?) Going back now, even though bending away from the direction the wire is wrapped, when carried far enough, results in a spiral, it is the first movement away from the wrap direction that is the basis for the simple guidelines, "wrap right to swing left" and "wrap left to swing right." Find a branched stick and experiment with these guidelines in mind. Better yet, work on several branched sticks shaping them into pleasing tree forms. Now try this on a bonsai. This kind of wiring not only gives good control it looks nice too.

Crossing wires is another issue. Even the most careful work will have some crossed wires. This is almost impossible to avoid in a thorough wiring job. But, wiring is easier, more effective and looks better when crossings are kept to a minimum. I like Kathy Shaner's very emphatic statement, "I never cross wires but I'll go under a lot of them."
What she does is to slip thinner wires through gaps between the larger --- loosely applied and heavier --- wire and the branch. Now an issue not so easy to explain; It is best, when going from the trunk to a branch, or from a primary branch to a secondary branch, to bring the wire over the branch when beginning its first wrap or under the branch? Most experienced bonsai artists know it does make a difference. The basic question is whether the wire will be stretched and tightened as the branch is moved or will it be compressed and loosened? In short, bring the wire over the branch to be bent down and under the branch to be lifted up. Hopefully, the diagrams accompanying these notes will help in explaining this (see Figure 8 first, and then study Figures 2, 3 and 6 as well.). **Bending the wired branch . . .** Some people apply the wire then bend the branch. Others apply the

wire while bending the branch. In some cases, the branch is bent then wire is applied. The two latter techniques are most often used on hard to bend wood. Whatever the approach, everyone agrees it is important to support the branch well with both hands while bending. Use your thumbs to apply pressure inside the bend and finger tips to support the outside of the bend.

Avoid repetitious adjustment or "pumping" of the wired branch. This can result in death of that branch especially if it was already weak growing. **Impact of pulling branches down and lifting branch tips up . . .** Remember that wiring or guying branches down almost always slows growth and weakens that part of a tree. (When you pull it down, you slow it down.) Lifting branches or branch tips up, on the other hand, is invigorating. Wiring it upward temporarily can help in saving a weak branch. Wiring the tips of a pulled-down branch up somewhat is not just aesthetically pleasing; it also helps retain health and vigor of the lowered branch. Incidentally, in twisting and lowering branches it is also important to keep the foliage "fans" of conifers like arborvitae and hinoki cypress oriented with the same surfaces turned up toward the sun rather than turning them upside down.

Care after wiring . . .
Remember that wiring is stressful and thorough wiring is extremely stressful to a tree. Protect the heavily wired tree in the same way you would protect a freshly potted tree. Keep it out of wind and direct sun for five to ten days depending on severity of wiring and mist the foliage as often as two or three times a day if possible. This is not the time to add further stress by pruning, fertilization or pesticide application. Be extra careful with watering too. Don't let the soil get dry but don't keep it constantly full of water either.

When do you take the wire off? . . .
"Just before it cuts into the tree." It is growth that sets branches in their new positions and it is growth (thickening) that results in wire cutting into the tree. Watch especially for wire cutting in on the most vigorous shoots (those highest in the tree) and at branch bases where the wire will be tight and branch thickening rapid. If you don't find any evidence of cutting in, leave the wire on longer. If you do remove the wire, allow some recovery time if the tree seems weak. Then rewire anything that has not stayed where you want it. The process is ongoing even in maintaining very old bonsai.

Finally . . .
Actually, it is my impression that many – probably most – of the really proficient bonsai wirers follow these guidelines without any need to put them into words. They rely instead on sound instincts acquired through lots of practice. The goal here is to help those who don't have these instincts make their own practice more productive by being aware of these ideas.

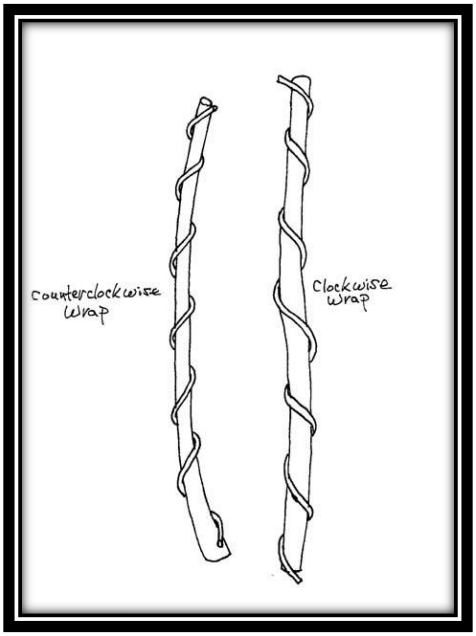


Figure 1(left): To convince yourself that these wraps are fundamentally different, study this diagram, but to make the experience really meaningful, get your own sticks and some wire thick enough to hold a bend in them. Wrap one stick clockwise and the other counterclockwise then experiment with bending these wired sticks

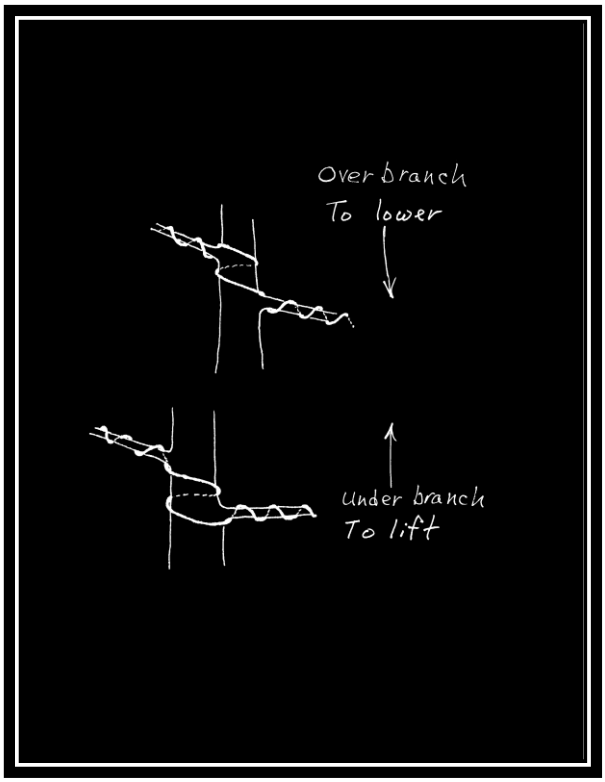


Figure 2 (right): Whenever possible, wiring two branches with a single wire anchors the wire very well. As illustrated here, having the wire make a pass or two around the trunk between branches is good in that it gives great control over the adjustment of each branch. Bring the initial wrap down over the branch to be lowered and up under the branch to be lifted up. See Figure 8 first, then Figures 3 and 6 and their captions for more explanation.

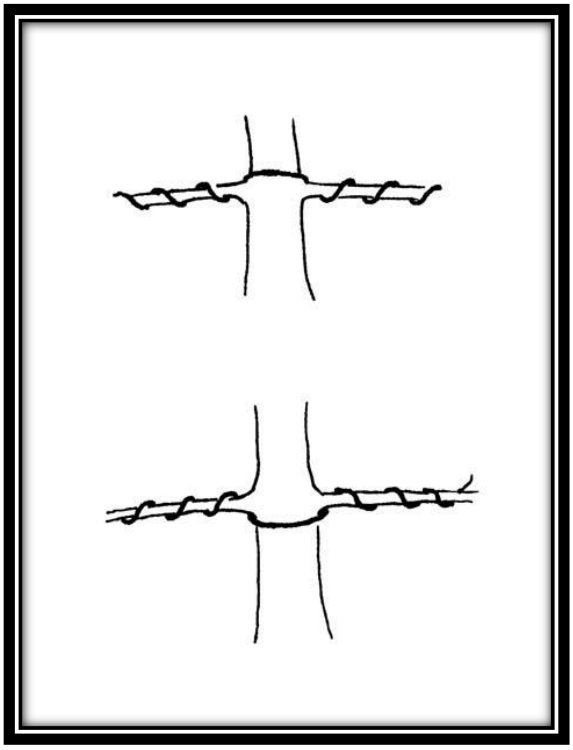
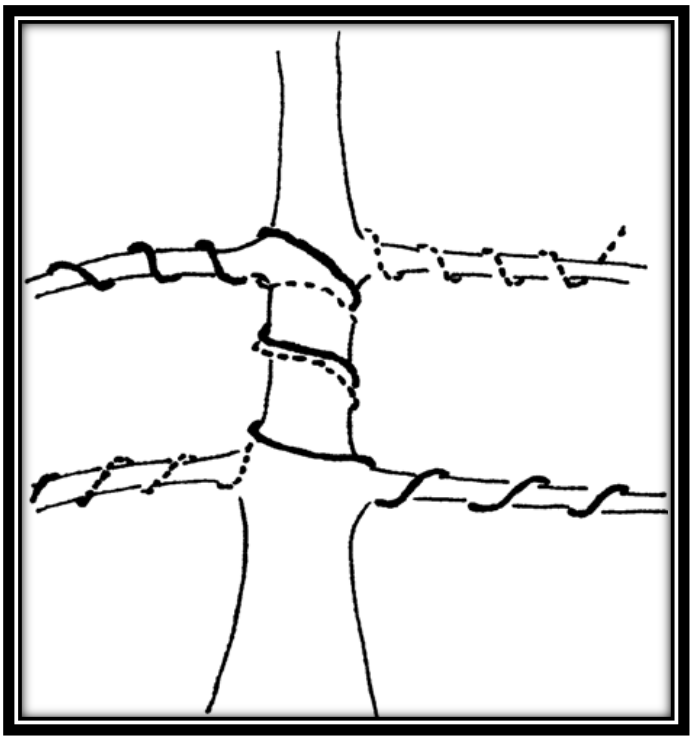


Figure 3 (left): Wiring opposing branches without making a turn of wire completely around the trunk can be unstable if not wrapped as shown here (one branch wrapped clockwise and the other counterclockwise). When both branches are wired in the same direction, if one branch is pulled up or down, the other branch tends to move in the opposite direction (the teeter-totter effect much noted in bonsai literature). The wiring illustrated in the upper diagram will work well if both branches are pulled down and toward the viewer thus tightening the wire. The wiring illustrated in the lower diagram will work well if both branches are pushed up and away from the viewer (again tightening the wire).

Figure 4: Although the branch arrangement is weak aesthetically, this diagram illustrates a way – when wiring multiple opposed branches -- to gain the stability offered by a pass or two of wire around the trunk even though branches to be wired are directly opposed. In this sketch the solid line represents one wire and the dash line represents another wire. Notice that each of these branches could easily have been wrapped in the opposite direction without changing the direction of other wraps.



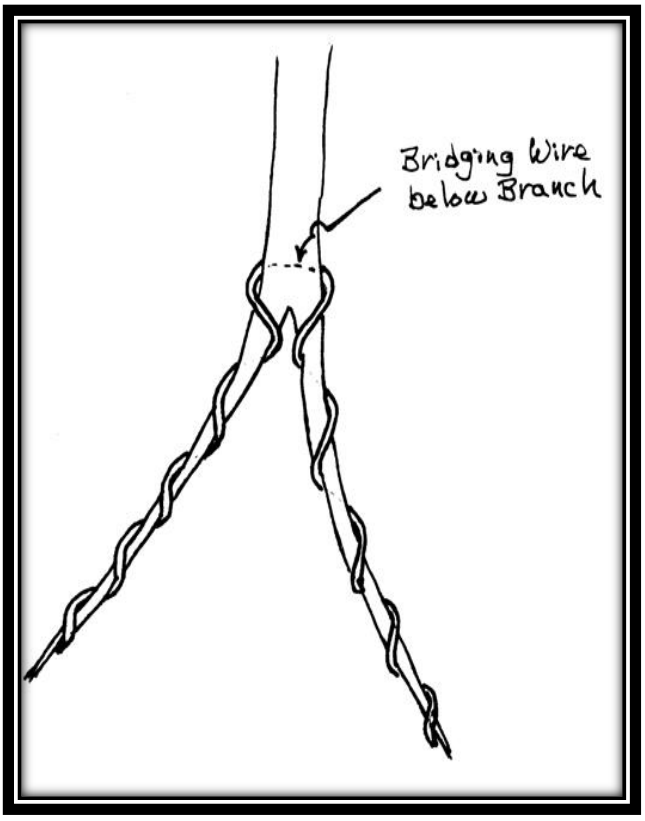


Figure 5): This illustrates what I think of as "frog legs" wire application. In many situations, particularly in wiring forks of horizontal branches, using a single piece of wire to wrap the "legs" in opposite directions works well. The reader, who takes time to get a forked stick, wire it as illustrated and then hold it horizontal, will find that by rotating each leg in the direction the wire is wrapped the legs can be swung upward and outward with good control. Next, flip the fork over so the bridging wire passes above the parent branch and you will discover that twisting the legs now in the direction the wire is wrapped swings them downward and together with good control. The guideline here is to begin with the bridging wire under to swing the legs up and out, and begin with the bridging wire over to swing the legs down and in. Prove this to yourself.

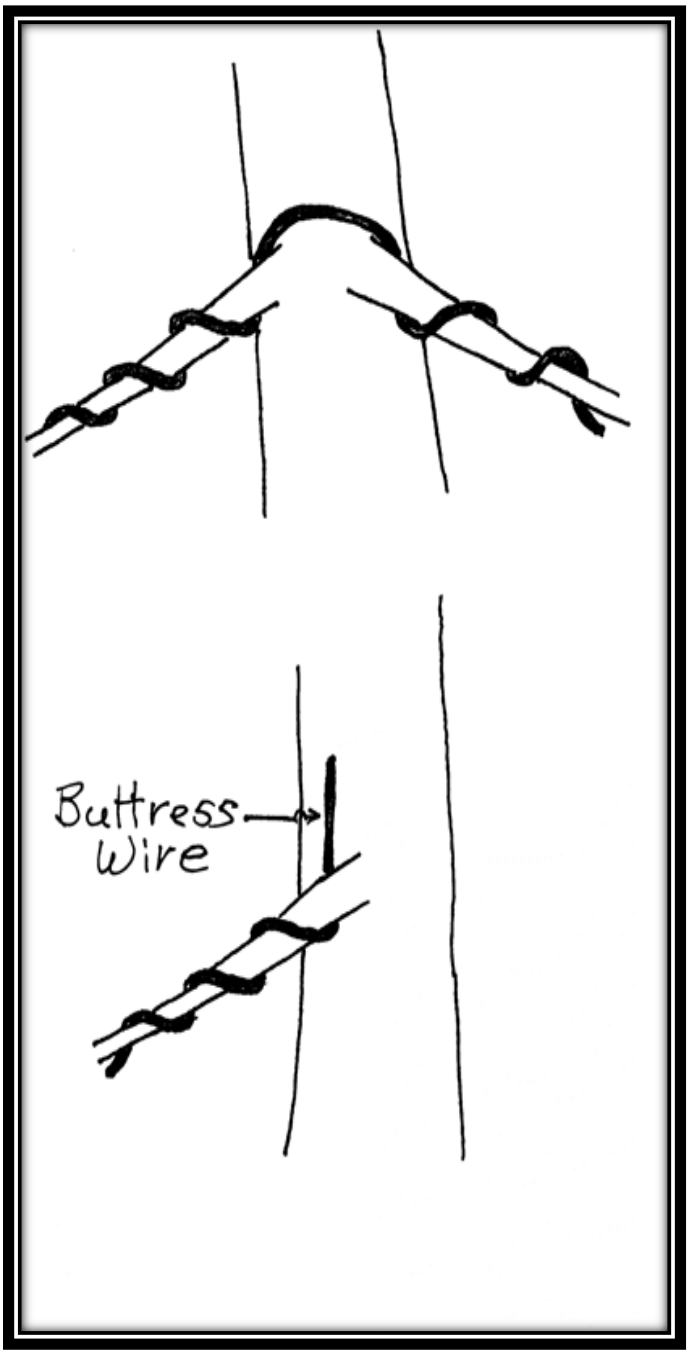


Figure 6: I like to call this “off the wall” wiring but it really is a useful way of wiring down two branches adjacent on a trunk without passing the wire around the trunk. Notice that this is a repetition of the frog leg wiring above. And, again the guideline to pass the bridging wire over the branches to swing them down and together, or under to swing them up and out still applies.

Figure 7: This variation (one legged frog?) of the “off the wall” wiring illustrated above is useful in lowering isolated small branches growing from thick trunks. Notice that for this wiring down to be effective, the buttress wire has to go up, away from the direction of the branch bend. Of course the buttress wire would be directed down if the goal was to lift the branch up.

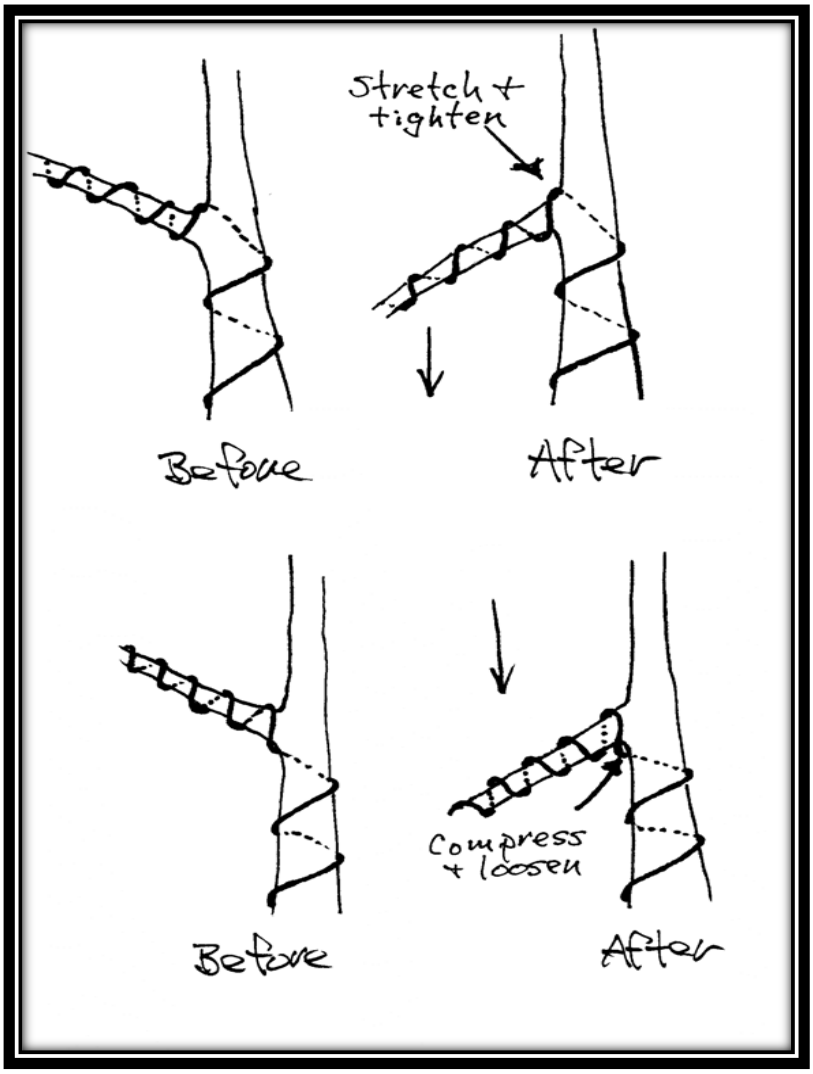


Figure 8: In the upper “Before” diagram, the initial wrap of the wire comes over the branch.
This works best in lowering the branch because it tightens the bridging section of the wire from the trunk to the branch. In the lower diagram, the initial wrap comes up from under the branch. Notice that lowering the branch actually tends to “push away” the bridging section of the wire. So bring the initial wrap down over the branch to be lowered and up under the branch to be lifted up.

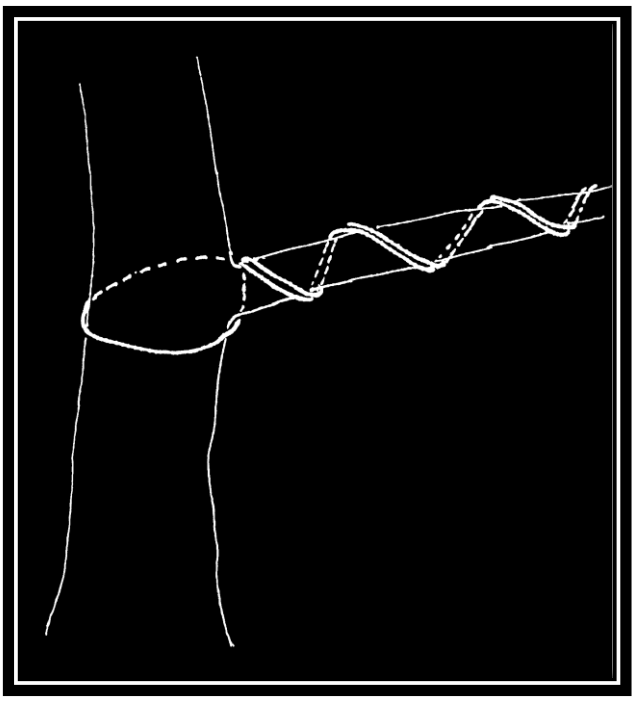
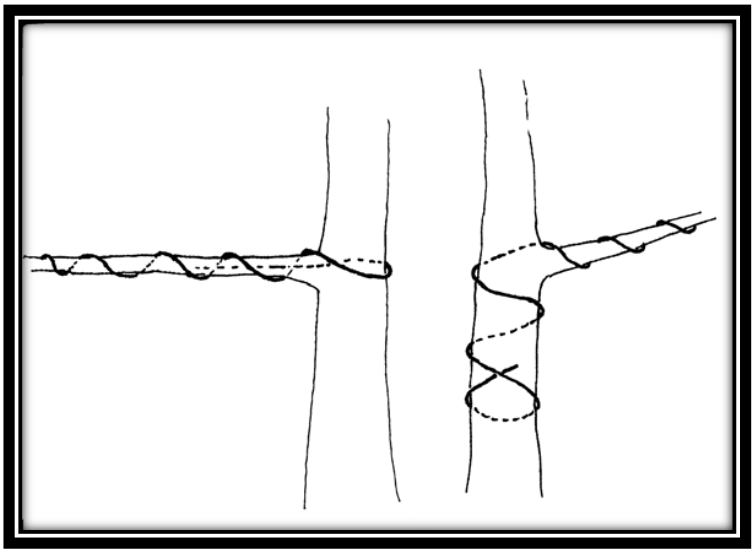


Figure 9: This diagram illustrates a useful way of using a double length of wire, anchored by making a pass around the trunk, to control a branch. Actually one end of the wire might continue out toward the branch’s end and the other may be run out a strong secondary branch.

Figure 10: Two other ways that have been suggested for anchoring the end of a wire. The dash line represents wire behind the tree. In practice you will seldom use these because the other ways of anchoring give better control and seem more comfortable to apply.



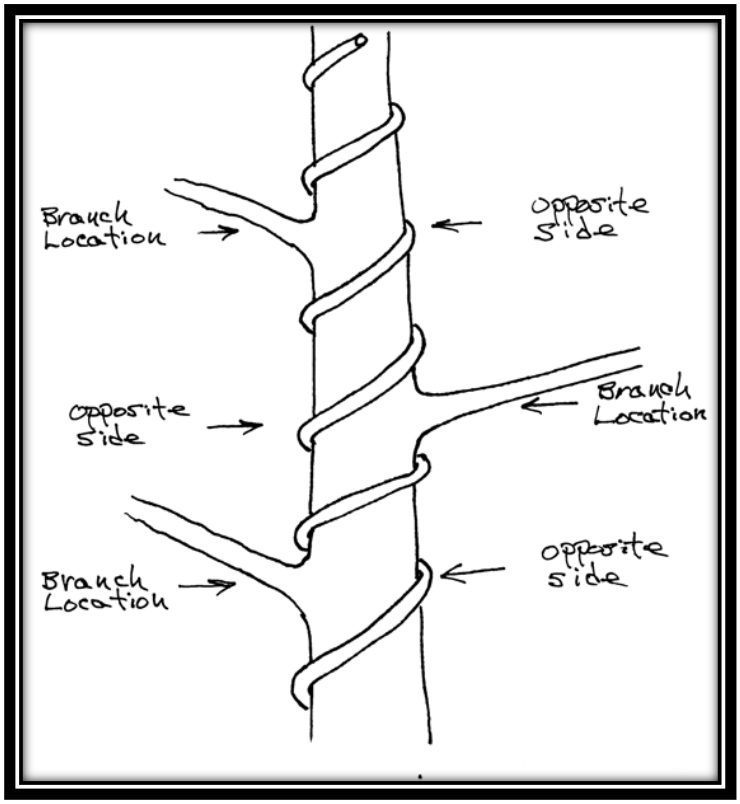
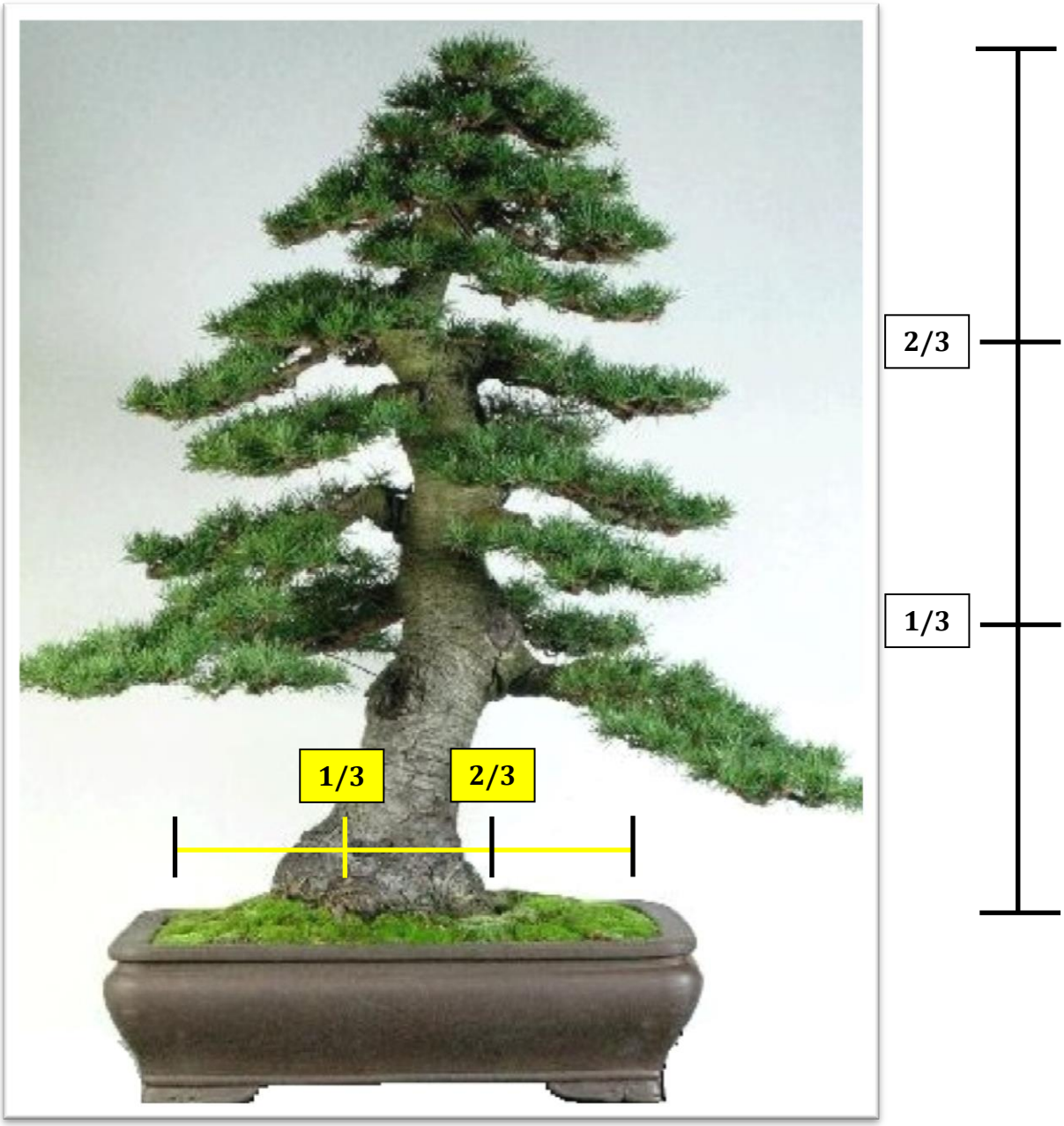


Figure 11: This diagram illustrates the “passing wire,” the wire that continues along the trunk or parent branch past a branch that will be wired later with another wire. The point being made here is that laying the wrap directly opposite the branch location leaves spaces both above and below the branch open for the secondary wire (the next wire to be applied, the one that will control the branch). The wirer is then free to wrap the branch either clockwise or counterclockwise depending on which direction it will be moved

BASIC PROPORTIONS



Classic proportions of the formal upright style are the basis for all Bonsai. The trunk design as viewed from the front is roughly divided into equal thirds.

1. The lowest third is open; only trunk and surface roots show,
2. The center third emphasizes the structure of the branches with some open spaces revealing portions of the trunk as it tapers toward the top.
3. In the upper third, the main branches divide into fine branches and finally into a network of twigs.

BASIC DESIGN

SCALENE TRIANGLE

Bonsai are designed around the scalene triangle (no two equal sides). If properly shaped, the tree can withstand dismemberment. This basic triangle will be evident in the whole, in each individual part, and from any angle (top, side, or front).

POTS

A tree is a tree; a pot is only a pot. It does not become a Bonsai until these two are combined and form a harmony together. A large part of the art of Bonsai is the experience of a tree that has become detached from its ground bondage and now lives a life in a pot. It fascinates us.

Actually, many containers can serve as a pot for a Bonsai tree, if they meet certain requirements. There has to be drainage holes of course, and wiring holes so that the tree can be fixed to the pot. They may be made out of ceramic, concrete, plastics and certain metals (metals may release toxins) and one can make their own pots. But what is considered a classic Bonsai pot is that it is made of ceramic or porcelain, and that it is stoneware burned, which means that it absorbs and holds no water in the material. It is important for the health of trees.

The tree's health comes first! A finished Bonsai often has undergone years of training to adapt their root system to smaller and smaller pots. As you already know, the practice of Bonsai is a lesson in patience and perseverance, and it certainly applies when it comes to finding the right pot. The most important thing to keep in mind when looking for a pot is the required measurement, especially the depth of the pot.

Maple Bonsai in a Bonsai pot that really enhances the colors of the leaves.

Basic guidelines on how to pick a pot

A large part of practicing Bonsai is how to be able to spot the right pot. Some go by their gut feeling. But that may be difficult for a beginner... So here are some basic rules and guidance for you to stick on to. Good luck and have fun in the pursuit of your tree´s future home.

- **Sex**
  Everything is about sex! The first thing you must do is to decide if your tree is masculine or feminine. Usually, a tree is a mix of both and question is which sex is the dominant. This is absolutely crucial and perhaps the most important rule in choosing a pot. Some attributes that can help you along the way is that the curves, grace, smooth bark and sparse branches is considered feminine. The corresponding masculine traits are strength, old bark, deadwood, thick trunk and dense branches.

- **Size**
  The general rule is: The pot should be of the same height as the trunk is wide above the nebari. Oval and rectangular pots are usually 2/3 of the trees height. Round or square pots is 1/3 the height of the tree - unless foliage is unusually large, then the pot is also becoming wider, this is compensated by lowering the height of the pot. Trident maples (which have rapidly growing roots) need, just as fruit and flowering trees deeper pots.

- **Design**
  The pots design should match the degree of masculinity or femininity of your tree. The closer you get, the more harmonious the experience of your final Bonsai. To accomplish this, I have as a potter several tools / attributes to work with. Should it be concave, convex, angular, round, oval, rectangular? Then to adjust the degree of feminine or masculine I can work with choice of rhyme, feet and glaze and decor.

Generally masculine pots are deep, angular, have clean lines and stout feet. A lip on the rim strengthens the masculinity; an inward rhyme reinforces the pot femininity. Feminine pots often have soft lines, delicate feet and are relatively low and sleek. Round pots, drum pots are generally considered to be androgynous.

The most general rule when it comes to choosing the glaze for a pot is that the color should appear in the tree, either in the bark, the color of the leaves, and fruit or flowers. Therefore, the unglazed brown, gray and earth tones are usually safe choices. They also provide warmth and stability to the tree. But we can also work with contrasting colors like blue or cool green. They provide balance and refreshes the composition.

The goal is to create harmony. Observe what choices others have done for their pot, discuss with others. Visit exhibitions; go to shows, read books. Do not hesitate to contact a potter and draw sketches or submit proposals for a pot that would suit your tree. Remember that there is not only one fitting choice of pot for your tree. There are usually multiple and what is best is a matter of your taste and it is you that first and foremost should be happy with your choice.

Where to buy Bonsai pots

When you think that your tree is ready, there are several ways to find a pot. You can contact a potter and make a custom order, or visit your local Bonsai nursery, fairs and Bonsai events where often potters are trading. Remember to bring all measurements of the tree and a photo. But if you are experienced and know what to look for, there are many auction sites and groups in social media where pots change owners. There is also the possibility that you can make your own pot? There are plenty of videos on YouTube showing you how to make a pot in different materials.

An unglazed Bonsai pot with round shapes.

TOOLS

Concave Branch pruner

Trimming Shears

Tweezers/spatula

Wire cutter

Bud scissors

Wire plier and nipper

Folding Pruning Saw

Only tools considered most necessary are pictured here

Root Rake

It is extremely important that Bonsai tools be kept clean and sharp. Dirty tools may transmit fungus and disease while dull tools tear instead of cutting. Your tools will have a longer useful life if cleaned after each use with alcohol and kept lubricated with tool oil.

GLOSSARY OF TERMS

ADVENTITIOUS BUD: A bud that occurs in an unusual place on a tree.
ACCENT PLANT: Is a small plant displayed next to a bonsai. Accent plants are typically used when a bonsai is being formally displayed at a show or exhibition. Accent plants can include any perennial, bamboo or grass.
AKADAMA: Classic Japanese Bonsai soil meaning red clay balls. Imported from Japan, this volcanic soil has been used for thousands of years by bonsai artists on most types of deciduous bonsai trees.
APEX: The highest point of the tree, this can be a single branch or can consist of a series of small branches.
APICAL: Growth produced by a plant which is most vigorous, in the majority of species this at the furthest points of the plant from the root system (upper and outermost branches)
BACKBUDDING: Process by which apical growth is pruned to induce growth further back along the branch or trunk.
BUDBREAK: The point at which a bud has opened enough to show a green tip.
BUDBURST: The point at which a buds contents unfurl (the new leaves appear).
BUD EXTENSION The point before budbreak where the tiny buds that have been on the branch since the previous year begins to swell and extend.
BLEEDING: The loss of sap caused by wounding or pruning
BRANCHES: The *Primary* branches are those that grow directly from the trunk; the *Secondary* branches are those that grow directly from the primary branches, the *Tertiary* branches grow from the secondary branches.
BROAD-LEAVED/CONIFEROUS: Conifers belong to the group of naked-seeded plants known as *gymnosperms;* their seeds are not enclosed in an ovary. Conifers have leaves which are needle-shaped or scale-like. With a few notable exceptions they are evergreen. Broad-leaved trees are a much larger group belonging to the *angiosperms* or flowering plants which have seeds enclosed in an ovary. The majority is deciduous and goes dormant in autumn through to spring.
BUD: Organ or shoot that contains an embryonic branch, leaf or flower.
BUTTRESSING: This is also known as root-flare, where the base of the tree flares outwards giving the feeling of great age and solidity.
CALLUS: Tissue that forms over a wound on a branch or trunk as part of the healing process.
CAMBIUM: The layer of living tissue [typically green] between the sapwood and the bark. In regions where there are alternating seasons, each year's growth laid down by the cambium is discernible because of the contrast between the large wood elements produced in the spring and the smaller ones produced in the summer. These are the annual rings, by which the age of a tree can be established.
CANDLE: Name given to the extending bud of a Pine before the new needles open.
CANOPY: The peripheral foliage of the upper branches and those on the outer part of the tree.
CHLOROSIS: Loss of chlorophyll and leaf color as a result of mineral deficiency.
CHOP: Commonly used word that describes the heavy pruning and reduction in height of the trunk of a tree.
COMMON NAME: Simply the name a plant is commonly known by, however, common names can be very non-specific ('Maple' could refer to any one of hundreds of trees) and can vary from region to region. It is always better to try to remember a trees' specific Latin name as this nomenclature is specific to each and every plant, the world over.
CONCAVE CUTTERS: a bonsai tool used to remove branches with a flush or slightly depression cut. Concave cutters are one of the most important bonsai tools you can own. They are necessary to style bonsai and pre-bonsai nursery stock. There are specifically designed to cut branches flush to the trunk. This type of cut allows the wound to heal quickly and smoothly, and without creating an unsightly bump on the trunk of your bonsai tree.
CONIFER: A tree that bears cones; mainly evergreen trees such as: pines, cedars, spruces and junipers. Coniferous trees have small and waxy leaves, sometimes needles, which are usually kept all year.
CROWN: Upper part of a tree where branches spread out from the trunk and define your bonsai silhouette.
CULTIVAR A cultivated variety of a species i.e. Acer palmatum 'Bloodgood' or Acer palmatum 'Deshojo' are both Acer palmatum cultivars or varieties.
CUT PASTE: Wound sealant specially made to promote the healing and keep sap from bleeding. Very popular with experienced bonsaist.

DESSICATION: Lack of water; desiccated leaves usually occur when the roots are unable to supply water to them.
DECIDUOUS: A plant that sheds its leaves each year in Autumn- this can be a broad-leaved or a coniferous tree.
DEFOLIATION: The process of partly or completely removing the leaves of a tree during its summer dormant period to induce a crop of finer, smaller leaves which can greatly increase ramification.
DIEBACK: Death of growth beginning at tip from disease or injury.
DORMANCY - Is the resting period for bonsai, where little or no growth is produced - usually autumn and winter months.
ERICACEOUS: A term referring to acid loving, lime-hating plants.
EVERGREEN A plant that remains in leaf all year. It should be noted that evergreen trees slowly shed their oldest leaves at certain times of the year (depending on species) as they are replaced by new growth.
FEEDER ROOTS: Fine roots that absorb water and nutrients from the soil.

FORM: Used to categorize a bonsai using its most conspicuous aspect; this can be according to its trunk direction (formal or informal upright, slanting, cascade etc.) or its number of crowns (single trunk, multi-trunk or group) for instance.
GENUS: The name given to a group of plants that have a common feature- the first part of a plants Latin name i.e. ACER palmatum.
INDOOR BONSAI: More difficult to maintain than outdoor bonsai, indoor bonsai are normally tropical or subtropical species that need to be kept inside for part of the year, usually during periods of cold temperatures outside.
INTERNODE: Section of growth between two nodes (leaves or leaf-joints).
JIN: A deadwood effect on a bonsai- can be either an old branch or a protruding part of the trunk. Jins can be found naturally occurring on old collected trees though are more often than not, artificially created from unwanted branches.
LAYERING: Ground and air layering are methods of producing new roots from the trunk or branches of a tree; often used as a propagation method but also useful for correcting poor surface rots (nebari).
LITERATI: A bonsai form where the tree has a tall, slender trunk with no lower branches and only sparse foliage confined to the upper reaches of the tree.
MAME: Name given to bonsai less than 15cm/6 inches in height.
NEBARI: commonly-used Japanese term to describe the surface roots of a bonsai (those that can be seen on or above the surface of the soil).
NODE: Growth point on a branch or trunk from which leaves, leaf buds and shoots can arise.
OVERWATERING: Where a tree growing in poor-draining soil is given water too frequently (the soil does not begin to dry out before more water is applied). These decreases even further the amount of air available to the roots caused by the poorly drained soil. Eventually leads to dead roots and root rot.
PEAT: Organic bonsai soil component that has rightly fallen from favor amongst bonsai enthusiasts.
POTENSAI: 'Potential bonsai'.
RAMIFICATION: The repeated division of branches into secondary branches.
SEASONAL BONSAI: Species that only look their best for a short period of the year, for instance trees grown for their flowers or fruit.
SHARI: Deadwood on the trunk of a bonsai (as opposed to Jin which is a deadwood branch or protrusion).
SOIL: In the context of bonsai, soil does not refer to the soil found in the ground but specialist bonsai soils used for growing bonsai. *Organic* soils are those that contain ingredients derived from plants; peat, bark or leaf litter. *Inorganic* soils contain inert materials, mineral, stone or hardened/fired clays such as grit, sand, Akadama or Turface.
SUIBAN: A shallow tray with no drainage holes that is commonly filled with either gravel or water and can house rock plantings.
SPECIES: The subdivision of Genus; the second name in Latin nomenclature i.e. Acer PALMATUM.
SPHAGNUM MOSS: Generic/general name given to long-fibred moss, used as a soil component for bonsai and layering. *Sphagnum Moss Peat* is rotted and broken down Sphagnum Moss and does not have the same positive properties for bonsai or layering.
STYLE: The style of a tree has previously been used to describe the main direction the trunk of a tree takes; this should be correctly referred to as the form. The style of the tree describes the way a bonsai has been shaped to create an image of its fully grown counterpart; this can be in a contemporary or a classical style, an impressionistic or an expressionistic style.
SYNONYM: An alternative Latin name for a plant, usually an old or invalid classification.

TREE: Commonly bonsai growers will refer to their bonsai as trees rather than as bonsai.
URO: A carved (or natural) deadwood hollow, often seen on (but not limited to) deciduous trees.
UNDERWATERING: Where a tree is allowed to dry out or is not watered thoroughly when required.
VARIETY: The sub-division of Species; the third name in Latin nomenclature i.e. Acer palmatum 'DESHOJO'.
XYLEM: Area below cambium in the trunk.
YAMADORI: Trees collected from the wild for the use as bonsai; originally used to describe wild trees collected from mountainous regions.