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 (see Spring 2002 ABS Journal article, "Making it Bend," by Andy Smith).

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. "I cut it twice and it's still too short." "Remember, you can't cut it back on." 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. Is it 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, 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 . . .

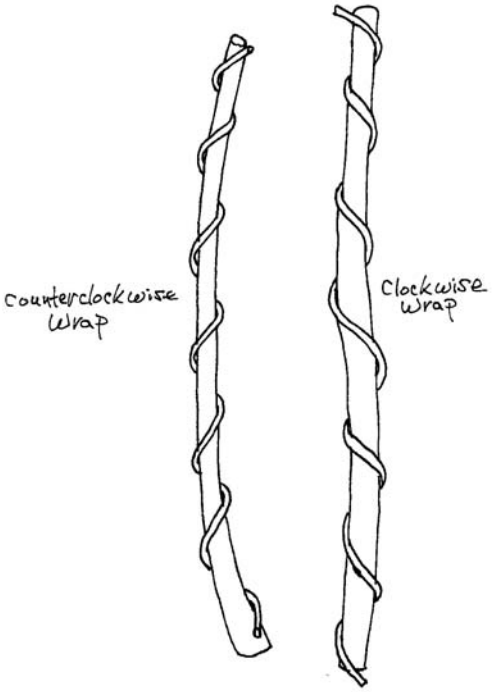
Remember that wiring is stressful and thorough wiring is extremely stressful to a tree. Protect the heavily wired tree in the same way you would protect a freshly potted tree. Keep it out of wind and direct sun for five to ten days depending on severity of wiring and mist the foliage as often as two 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.



Note: These wiring diagrams will be far more instructive if readers take time to cut tree-like branch ends from the trees or shrubs in their landscape and experiment in applying wire as shown here.

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 (see related text in last paragraph on page 5).

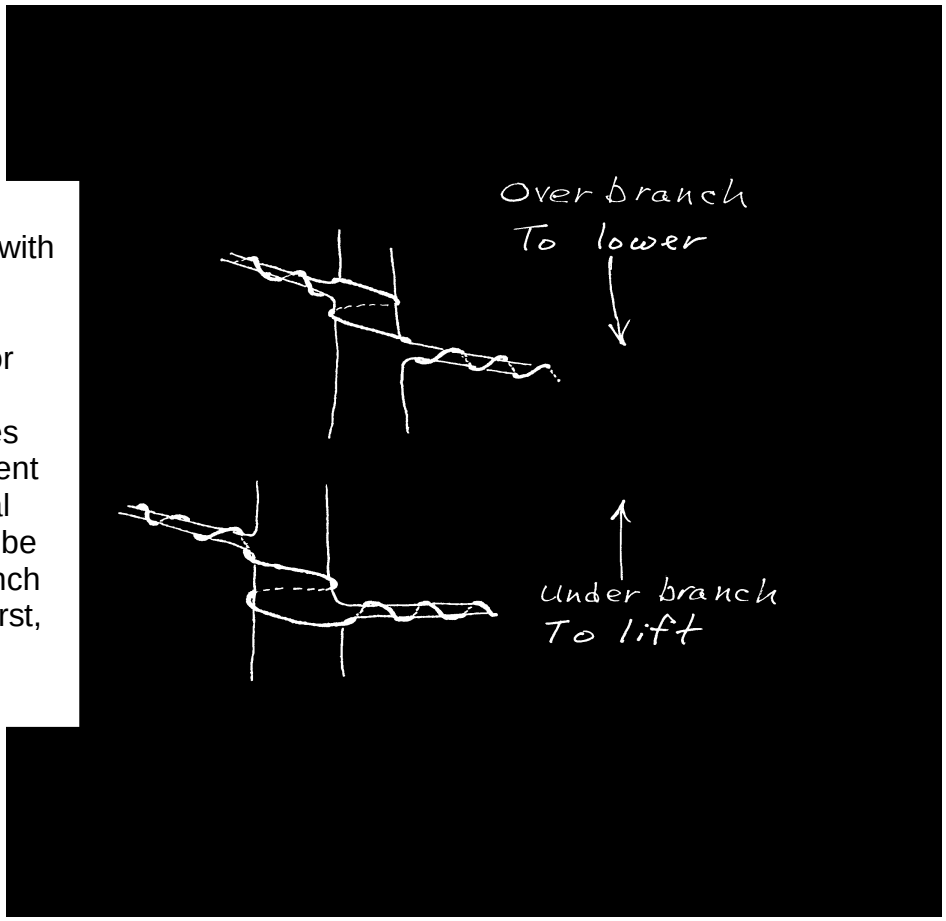


Figure 2 (right): Whenever possible, wiring two branches with a single wire anchors the wire very well. As illustrated here, having the wire make a pass or two around the trunk between branches is good in that it gives great control over the adjustment of each branch. Bring the initial wrap down over 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.

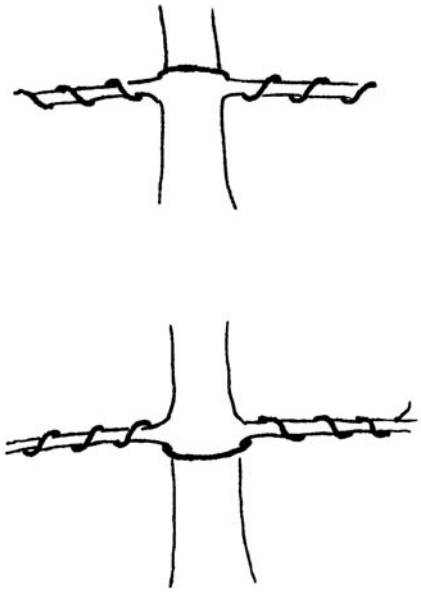
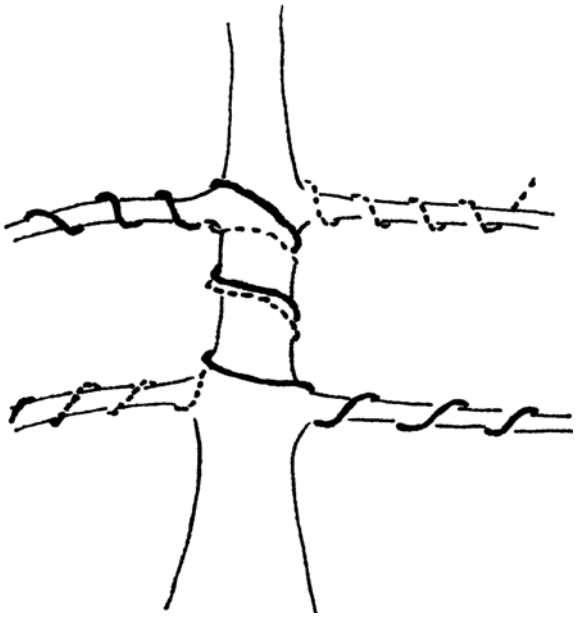


Figure 3 (left): Wiring opposing branches without making a turn of wire completely around the trunk can be unstable if not wrapped as shown here (one branch wrapped clockwise and the other counterclockwise). When both branches are wired in the same direction, if one branch is pulled up or down, the other 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 (right): 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.



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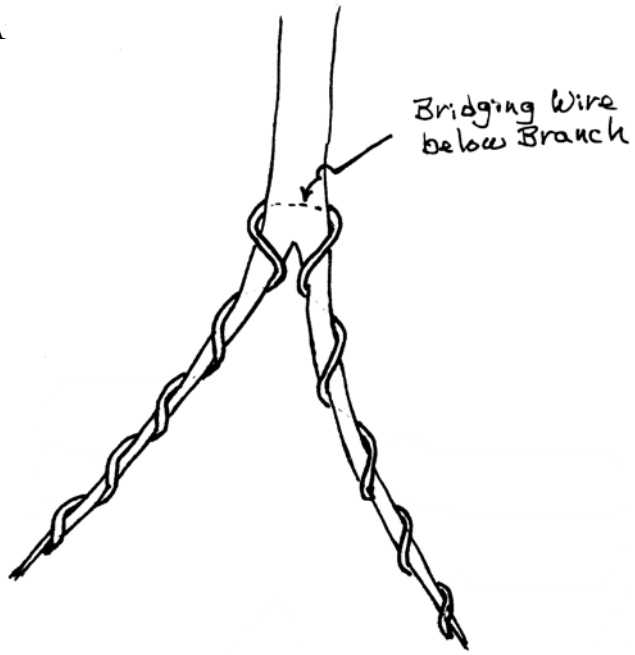


Figure 5 (left): This illustrates what I think of as “frog legs” wire application. In many situations, particularly in wiring forks of horizontal branches, using a single piece of wire to wrap the “legs” in opposite directions works well. The reader, who takes time to get a forked stick, wire it as illustrated 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.

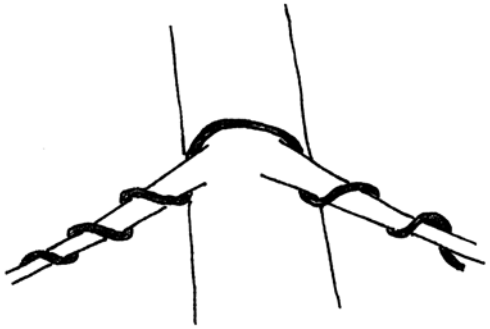


Figure 6 (right): I like to call this “off the wall” wiring but it really is a useful way of wiring down two branches adjacent on a trunk without passing the wire around the trunk. Notice that this is a repetition of the frog leg wiring above. And, again the guideline to pass the bridging wire over the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

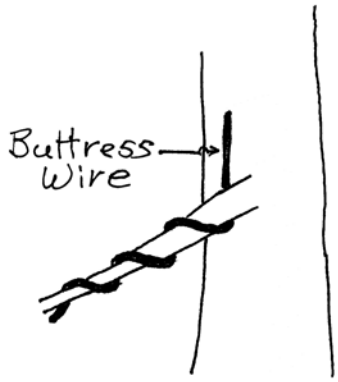
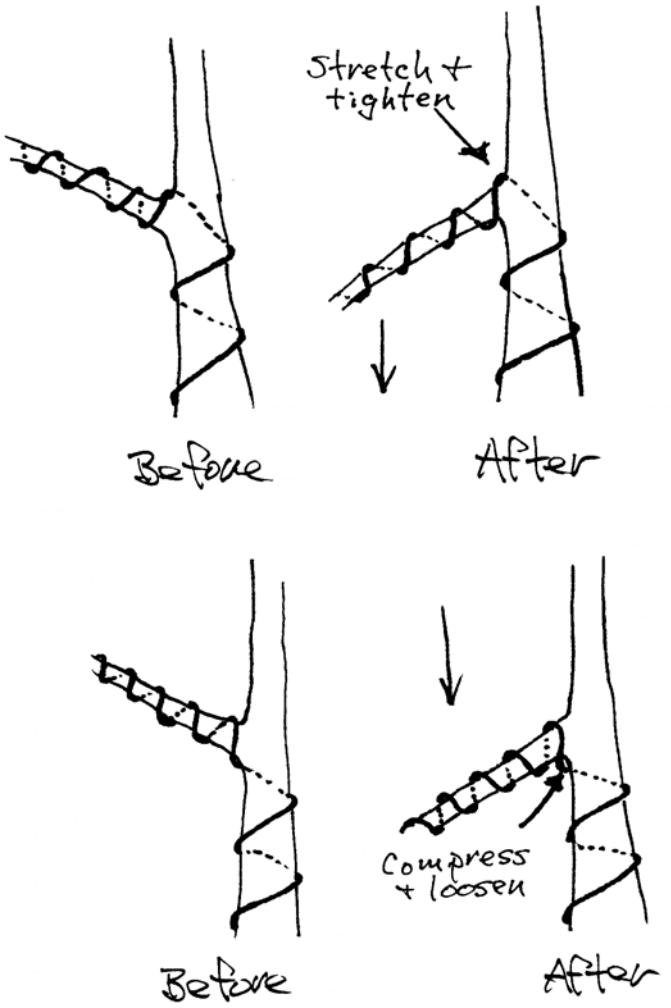


Figure 7 (right): This variation (one legged frog?) of the “off the wall” wiring illustrated above is useful in lowering isolated small branches growing from thick trunks. Notice that for this wiring down to be effective, the buttress wire has to go up, away from the direction of the branch bend. Of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

Figure 8 (right): 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.



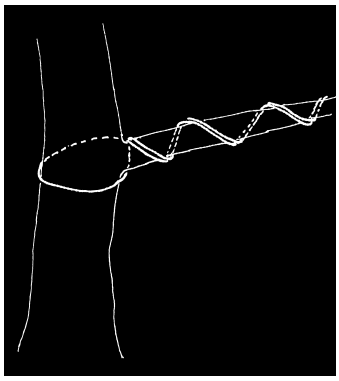
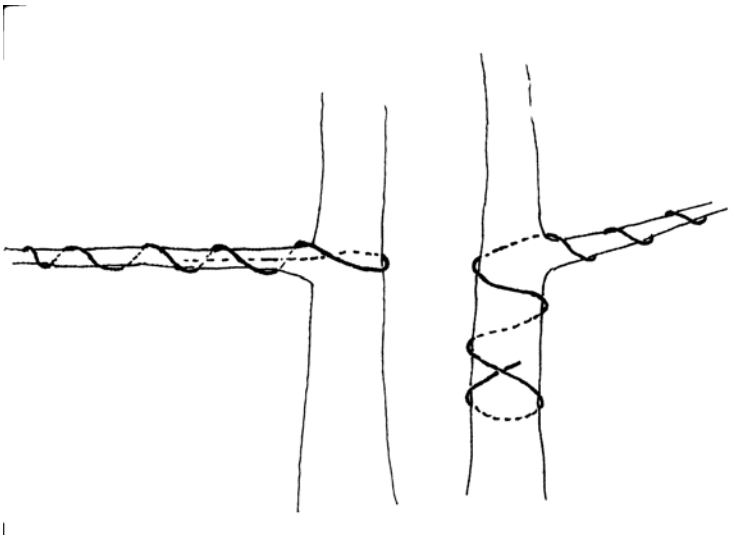


Figure 9 (left): This diagram illustrates a useful way of using a double length of wire, anchored by making a pass around the trunk, to control a branch. Actually one end of the wire might continue out toward the branch’s end and the other may be run out a strong secondary branch.

Figure 10 (right): 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.



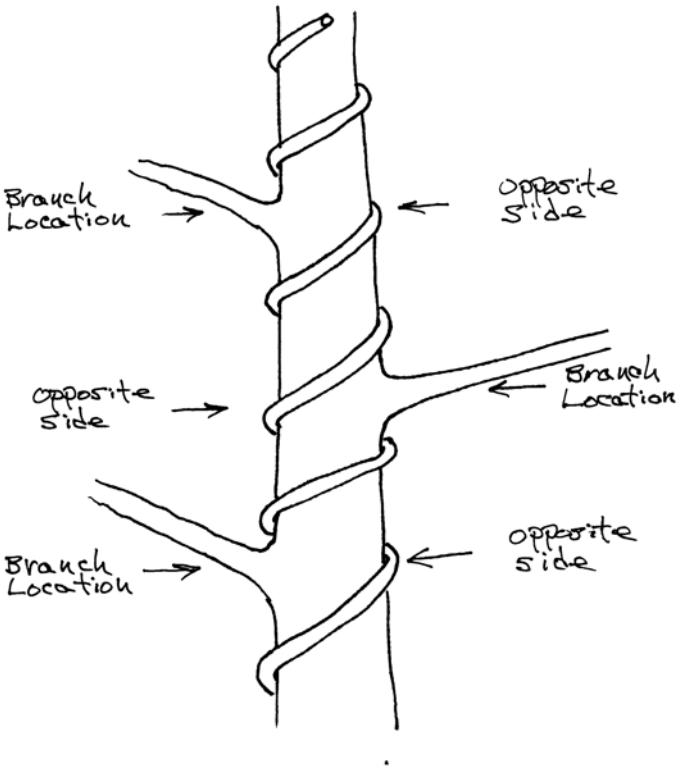


Figure 11 (left): This diagram illustrates the "passing wire," the wire that continues along the trunk or parent branch past a branch that will be wired later with another wire. The point being made here is that laying the wrap directly opposite the branch location leaves spaces both above and below 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.