Healthy Trees For Life

A guide for Natural Tree Maintenance and Pest Control

By Ronald Lavoy Curtis

I want to express my appreciation to Patrick McLane for his help typing and editing this book. I truly value his friendship and his belief in the natural process of keeping trees healthy and free from insects and disease.

This book is about trees and about some of the natural ways of caring for them, without harmful chemicals and procedures. The information herein has been gathered for over 50 years of working in this industry and was derived mostly by way of hands-on experience. These processes and procedures for the most part are those that have worked well for me over the years. I only hope that this information will help provide a greater understanding of trees and their needs.

I believe trees have a spirit or some kind of inner consciousness that is hard to understand and we need to realize that they are living things, not objects to be destroyed or taken for granted.

They are our allies and co-members of a complex ecological community.

Like brothers we must learn to care for them correctly and individually, whether in our yards or forest or lining our streets.

For without them we may cease to exist on this planet.

Ronald Lavoy Curtis.

Table of Contents

Purchasing a Tree

The first part of this book will be to discuss how to pick out a tree, how to go to a nursery to buy a new tree or to a neighbor's yard to dig up a tree and transplant it to your yard or business. Hopefully you can get a better understanding of how to plant them the proper way. The proper way to pick them out at the nursery, and be able to tell which would be the best tree for your particular situation.

As we all know there are numerous species of trees and so sometimes it gets really difficult to find the right one when you go to buy a tree. You must consider not only the size but the species of tree based on the configuration of your yard, but also the size you want the tree to grow and how well it will do in the soil you have in your yard. These factors are extremely important as you pick from hundreds of species of trees, and particularly from the numerous trees that will do well in your area. Sometimes nurseries have experts that can help you pick a tree that will do well in your yard, but it would be to your benefit to do some quality research first.

I will also discuss some things you need to look for to make sure you get a tree that will not cause you expensive problems in the future. First of all look at the shape and symmetry of the tree. Make sure there are no branches crossing over one another, lopsided, etc. because it takes particular knowledge and skill to properly trim trees. Also look for places in the bark of the tree that has been damaged or split open. Look in the crotches of all of the lateral limbs for gaps, cavities, openings or evidence of splitting. Any of these things may seem insignificant now, but when you plant the tree and it begins to grow, any of these conditions could potentially be very detrimental to it somewhere down the road.

You need to also look at the root system and how the roots are attached to the tree. Is the tree surface rooted? Is the trunk straight in the container it comes in? Also be aware of what the tree is contained in. Is the container easily opened so that you can get the tree out without damage? Has it been in the same container for a season or too long? Is it a bare root tree? Are the roots wrapped in burlap? Have the roots been dried out? All of these things you need to be aware of before you purchase the tree. Make sure you go to a nursery where the people are knowledgeable and you feel you can trust them. But really the main thing is that you look the tree over carefully yourself to determine the overall condition of the tree.

Now the next thing you want to look for is disease. You will want to make sure there are no insects on the tree. Look at the leaves to see if they have been eaten up. Make sure it has good color. Of course if you are buying a tree in the Fall, as the tree is going into dormancy, the leaves are not going to look lush and green as they would in the spring of the year. Just be aware of these things as you are shopping for your tree. You will find that trees are less expensive in the Fall compared to the trees you buy in the Spring. You will also find more established trees in the Fall because obviously they have had a whole growing season through the Summer. In fact trees are easier to plant the more established

the root system is. You can also look for trees in the Spring that have been held over through the Winter. Talk to a reputable nursery and they will help you.

Ok, now let's discuss the size of trees. In general, trees at a nursery are smaller. They are more easily planted and not as apt to experience transplant shock. So nurseries can offer a better guarantee on smaller trees. Basically, these will be trees of 1" to 2.5" caliper (the diameter of the tree trunk in inches). These trees will typically be in pots from 2 to 10 gallons. Of course a 10 gallon pot is a lot harder to move and you may need some extra help with a bigger pot. But most of the time trees in larger containers have been able to establish a root system. So these are sizes that are small enough for most individuals to plant. The bigger trees are in huge crates or very large containers that you would need a front-end loader and a big truck to move. For bigger trees you would also need a very large hole to plant them in the ground. It is also harder for bigger trees to establish themselves and for you to keep them alive than it is with a smaller tree. It depends of course on your financial situation as well. If you can afford it and you don't want to wait a long time for shade then you can go with the larger tree.

There are ways now, compared to the old days, using a tree-spade (it is a machine with hydraulic blades mounted on a large truck) to go in and take out of the ground a larger diameter tree. It can pull the tree out vertically and lay it down horizontally and you can head on down the road to a new location. It can also be used to enlarge a hole in the ground by inserting it into the ground and opening the blades. Using this machine you can have quite a large tree in any location almost instantly. These would be trees of from 4" to 6" diameter ideally. Anything larger than that is extremely difficult to move and generally there is no guarantee a larger tree would survive being moved. It is not very cost effective to try to move very large trees, but a 4" to 6" caliper tree can be moved quite successfully. There are people with the ability, using these spades, to do this; so it is something that is available if you want a larger tree to have instant shade without having to wait half your life for a small tree to grow.

Tree Planting

Now let's discuss planting the tree you have selected.

First, you must determine how big the hole needs to be to accommodate your tree. This is a very important part of the tree being able to survive once it has been planted. The hole has a great deal to do with how well the tree will grow and whether it will be able to mature and become healthy and strong. It all starts with the size of the hole and the type of soil – whether it's compacted with clay, rocky or sandy for example.

Now this hole should be at least 4" to 6" larger than the root ball of the tree being planted. That is to say the hole should be 4" to 6" larger than the root structure, around the roots entire circumference. This includes the bottom of the root structure. At least 6" in depth of loose, loamy soil under the bottom of the root ball when you put it in the hole would be the minimum. The wider you can make the hole the better off you are, because we want to put very good soil around the root ball. The more good soil you can put around the tree roots the healthier the tree will become. Once the tree gets itself established in this good, soft, loamy soil, then the roots can work their way through almost any kind of soil as it grows. So the purpose of this is to get the tree established.

Now let's discuss a little bit about what constitutes "good" soil.

Now to repeat, the 4" to 6" inches around the root ball is a minimum. With good soil around the trees roots the better and faster the tree will establish a strong root system. There are many brands and kinds of pre-mixed soil in just about every nursery. Lowe's, Home Depot, almost anywhere you go now, you can find premixed bags of good humus compost. I like to mix this in with good topsoil. Not clay soil or sandy soil, but good, dark, soft, smooth topsoil. Stuff that when you take it in your hand and squeeze it, it holds together, but then falls apart easily. That's a good way to test it. If you squeeze it and it has too much clay, it will hold together, almost like molding clay, and will be difficult to break apart again. If it is too sandy, then it won't hold together in the first place when you try to squeeze it together. You can get by with the sandy soil if you use a lot of compost, but you don't want to use either one of these kinds of soil if you can avoid it. You want to use a soil that just holds together when you squeeze it in your hand and then falls apart again when you touch it. That's what you want to put in the hole.

There is a product that I highly recommend before you put the dirt back in the hole. This is a product that I have found to be extremely beneficial in that it enhances the root growth and helps to establish a good strong root system. It reduces shock. This product is called Myke - All Natural Tree and Shrub Transplanter. It is in a small granular form. It's easy to use, not terribly expensive and you should be able to buy it and most any quality nursery. And most nurseries will give you a longer guarantee on your new tree if you use this product. It's really a good product for establishing a good root system. For small trees 1" to 5" inch caliper tree use one eighth, to one-quarter cup. For a 6" or 7" inch caliper tree it is one half a cup. For an 8" to 10" inch tree it is one cup. Trees 12" to 15"

use two cups. Spread this into the soil around the root ball once you have the tree in the hole. You will be very happy with the results if you use this product.

Now it's time to put the tree with the root ball into the hole that you have prepared. And one thing that I have seen that causes tremendous damage to trees is when people have planted a tree and have not removed all of the twine and wire or whatever held the root ball. As the tree grows this twine or wire can actually strangle a tree to death! So please remove all twine, the wire basket that holds the root ball, or any other strapping, rope or burlap that may be around the root ball on a new tree.

I'd like to explain a technique that I have found very useful in helping the roots grow deeper into the ground rather than growing out horizontally and closer to the surface. By using this process your tree will be more stable. It's very simple. Before you put the root ball into the hole, you need to mound-up the dirt into a cone shape in the bottom of the hole so when you set the tree into the hole it sets on this cone-shaped mound. This mound needs to be a little bit compacted so that when you put the tree in the hole this mound will hold the tree up a bit. This allows for the roots to drop more pointing down into the ground as it sets upon this mound of dirt. You also want to have another person help to make sure the tree is straight in the ground. Then, you back fill and this will help the roots grow down and out, rather that straight out vertically from the tree.

Now, start putting your dirt into the hole and fill it up to where it's as much as an inch above the surrounding ground because it's going to settle. Fill in the hole to above the ground level by an inch or so, you have to use your own judgement as to how much it will settle, but what you don't want to do is compact the dirt around the new tree. What you do want to do at this point is to have a water hose or can available now to water the ground enough to pull all of the air out of the ground. As you put the water on the ground around the tree you will see the air bubbles form, this is the air coming up out of the ground around the tree. Continue to add water until you have pretty much saturated the soil and that will eliminate all of the air bubbles.

Tree Staking and Bracing

This process is quite important because it holds the tree in a straight upright position until the root system has time to establish itself to be able to withstand a strong wind or heavy snowfall.

There are many ways you can stake a tree down. I would like to describe some ways that have worked well for me over the years.

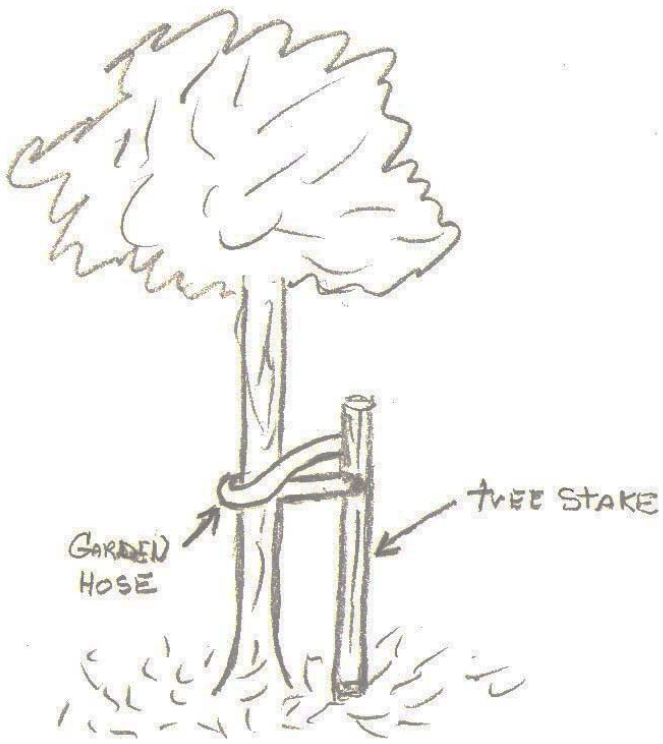
The first one is using a single stake. This has worked really well for me, but I do believe the tree has to learn to support itself. If the staking support is too rigid and strong, the tree doesn't develop a good root system to hold itself in the wind. This particular staking support allows the tree enough movement when it is windy that the roots develop their strength as an anchor. The stake support is there only for a short time to support the tree while it develops its own strength.

At every location on earth the wind will predominantly blow in a certain direction. The tree needs to develop its root system to be able to support the tree against these winds blowing mostly from a certain direction. You might live in an area where the wind blows mostly from the South; if that were the case you would want to locate the support stake so that the tree is allowed some movement when the wind is blowing from the predominant direction.

There are many types and sizes of stakes that you can use. What has worked best for me, especially for small caliper trees is a 2x2 five or six feet in length, pointed on one end, and then driven into the ground. You will have to use your own judgement based on the size of the tree, soil conditions and how far you feel you need to drive it into the ground. It needs to be driven into the ground deep enough that it will be strong enough and rigid enough, to support the tree.

You want to pound this stake into the ground with a sledgehammer. Go out a couple of inches from the root ball and drive it into the ground on the side of the tree from which the wind blows most frequently. (i.e. if the wind blows mostly from the North in your area, place the stake on the North side of the tree).

When the stake is driven securely into the ground take and old piece of garden hose long enough to go around the tree trunk and have both ends reach to the stake. Then, take a screw with a washer, or roofing nail that has a big flat head and secure one end or the other to the side of the stake. Next, take the hose around the opposite side of the tree trunk so that it makes half of a figure eight and bring it back to the opposite side of the stake and secure it there with another screw or nail. The hose will go around the tree and cross over itself coming back to the other side of the stake. This will secure the tree from blowing over in a strong wind, but will still allow the tree some lateral movement that will enable it to build strength. This then is the single stake method for securing a tree.



Now I'd like to describe one other way of staking smaller trees that has worked well for me in the past. That is to follow the same procedure as described above, but to use a 1" diameter PVC pipe as the stake. This works well if you are looking for something a bit more decorative. And there is good flex in the PVC, which allows the tree some movement and yet will still hold the tree in position for the time it takes to establish the root system. If you leave PVC in the sun for a long time, say two years, it will eventually become brittle and break. But it will work well for the length of time it takes for the tree to establish itself.

There is another tree staking process, but it's designed more for larger trees. That is to say those that have a trunk circumference of 4" or 5" and up. This process uses a tree stake that is about 7" inches around and generally made out of cedar wood. Theses stakes are milled specifically for trees, have a sharp point on one end and the best way to drive them into the ground is with a posthole driver. You can see these stakes often in large complexes where there are larger trees. You can use the same garden hose method with these larger stakes, but you will generally use two stakes, one each on opposite sides of the tree. On even larger trees sometimes three stakes are used. Often times wide rubber straps are used in place of garden hose. These straps are generally available from landscape stores. Most nurseries do not carry the wide rubber straps. If you can't find the

larger stakes and wide rubber straps you can always use the 2x2 or PVC and garden hose, which are all easy to come by.

You can send away for some of these materials and I would like to share with you the name of a company that supplies many tree related products. They are a very reliable company with very good products and I've purchased from them over the years and have found that they carry many products relating to trees and tree work. This company is A.M. Leonard and you can order their catalog by going to their website at www.amleo.com. You can also order their catalog by phone using the number provided on their website. Their catalog has a section where you will see a lot of this material we have discussed, from stakes, to rubber straps, to other techniques such as guy wires and different types of staking. They also carry paper wrap that you can put around young trees to protect them from freezing or keep the insects away from them. There is also a protective wrap that can be put around the bottom of trees to protect the bark from weed eaters. I recommend to you this company as a resource for products that will help you maintain your trees.

Transplanting a Tree

I mentioned earlier about being able to move larger trees with a tree spade. There are other ways of moving larger trees as well, and by larger I mean trees of from 8" to 15" in diameter. Moving trees is a lot of hard work and you can sometimes move them successfully with a backhoe, but it's quite risky because when you dig down in the ground with the bucket of the backhoe there will be damage done to the roots. You will be ripping the roots and if you don't get enough soil the roots may be out in the air for a long time while it is being transported to the new location. It is very difficult to move a larger tree successfully, but the way you can do it successfully is what I'd like to discuss.

First of all it should be a tree that makes it worthwhile to move at all. That it is desirable enough and healthy enough to make the move. If you come to the conclusion that you really want to save a particular tree and move it to a new location there is a way to do it.

There are some critical things you need to look for as you begin. The first being the location of power lines, the second is access into the location of the tree. In other words can you get to it, move it from its current location and get onto a road or highway in order to get it to where you will transplant it. The tree must be able to travel a short distance in an upright position until it is loaded on a truck, so it is critical that there be no power lines blocking that route. Once it is loaded onto a truck it can be laid down.

There are some materials you will need in order to move this tree. You will need a small roll of burlap in order to wrap the root ball once the tree is out of the ground, several 3" to 4" long nails, some good nylon twine or small rope and also 50' or so of good nylon rope and about 100' of 5/8 inch poly rope. You will also need a piece of flat steel. It doesn't have to be really thick, but it will need to be thick enough to hold the weight of the tree. This steel plate will be used as a skid. I'll describe how it's used later, but this skid is going to have to have one hole in each corner of the plate. These will be used to attach rope or chain to lift or slide the tree out of the ground once it is on this skid.

You are also going to need some tools or equipment. You will need a good shovel and a pick, a sledgehammer and a regular carpenters hammer. You'll need a good sharp axe or hatchet and sharp pair of limb loppers. That is about all you are going to need as far as equipment goes.

Once you have all of your material and equipment at the site, you will need to mark out from the trunk - using a can of marking paint – two circles around the tree. The inner circle is the size of the root ball. This should be between two and three feet out from the trunk. (The larger the tree the larger the root ball should be). The second circle should be two to three feet outside of the first.

The next step is to dig a trench down between the two circles on the ground to a depth of three to four feet. As you dig down you will need to cut off all of the tree roots that extend out to the circle closest to the tree using the shovel, limb loppers and axe. As you dig, begin to make a 45-degree ramp the width of the root ball, which will extend from

the bottom of the root ball up to the level of the ground. Do this in the direction you have determined will be best to avoid any obstructions. When you get down to the depth of three to four feet, begin to dig as much as possible under the tree to actually create a root ball. With help you may be able to begin to sway the tree back and forth in order to remove as much dirt as possible from under the root ball and cut off as many roots as possible. However, you want to keep as much dirt as possible on the root ball to prevent too much drying of the roots during transport to the new location. At this point you will need to wrap the root ball with the burlap and secure it to the roots using the long nails. At the top of the root ball where it meets the trunk you will tie a loop of rope around the tree with about 6" or so of play. Once the root ball is wrapped with the burlap, take the twine and weave it around the root ball using this loop of rope that is around the tree trunk. This will enable you to secure the burlap tightly around the root ball.

Next take the steel plate and using the sledgehammer pound it under the root ball so that it completely severs the remaining roots under the tree. Once the plate is under the root ball you will be able to attach chains, using the holes in the plate. By attaching the chains to a vehicle you can slide the tree up the 45-degree ramp and on up to the level ground. Or if you have the equipment, say a backhoe, you can use the bucket of the backhoe to lift the tree straight out of the ground on this plate. And if so you could then lift the tree up onto a truck as well. You will need a flat bed truck big enough to accommodate the width of the root ball, and long enough to accommodate the better part of the height of the tree lying down. If you don't have a backhoe you will need to use ramps and a pulley to load the tree onto a truck.

You will need to slide the tree on the skid up a ramp and onto the truck. The way to accomplish this is to secure a pulley at the front of the bed of the truck. The best way to secure the pulley is to run a line down between the cab and the bed and secure it to the frame. But, however you secure the pulley it must be secure enough to handle the weight of the tree, otherwise you risk serious injury or death if the pulley were to give way and hit you or someone else.

You will probably want to use heavy wood planks to make a ramp from the back of the bed down to the ground on which to slide the tree up onto the truck. And, you will want them to be long enough so that it is not too steep of an incline up to the truck bed.

After you have secured the pulley and have your ramp in place use at least a 5/8 inch poly line to go through the pulley and secure to two of the holes that are cut into the steel plate the tree is resting on. A poly line is preferable to nylon because nylon will stretch too much. The other end of the line will be secured to a vehicle that can then pull the weight of the tree up the ramp and onto the back of the truck. Secure two additional nylon lines to the trunk so that two people can stabilize the tree from either side as it is being pulled up the ramp. You will want to pull the tree all the way to the front of the bed so that you can then lay the tree back down onto the bed of the truck.

This is obviously something that is only going to be attempted when there are really good reasons to move a tree, but I wanted to give some information to show that it can be done.

It is a lot of hard work but with careful planning and by proceeding step by step you could move a large tree successfully.

One of the things that may reduce the ability of a tree to survive a transplant to a new location is if it gets very dried out while in transit. There are wax preparations that can be sprayed on foliage, branches and trunk that lays down a thick layer of wax that works quite well to prevent evaporation. This works particularly well on evergreens, but will also work on deciduous trees when they are in leaf.

Next, let's discuss the hole into which you will be transplanting your tree. The hole should be dug prior to the moving of the tree. The size of the hole should be at least two feet in diameter larger than the root ball and one to two feet deeper. If the root ball measures four feet across the hole should be six feet across. And if the root ball is two and a half feet deep the hole should be three and a half to four feet deep. The idea being, that you give the root ball two feet of good quality soil all the way around when it is planted. We want to allow the tree a good opportunity to reestablish a root system and this will be aided by having loose, rich, loamy soil in abundance all around the root ball.

It is important that you evaluate the type of soil you have at the new location. The main reason is to tell if there will be good drainage of water once the tree is planted. Rocky soil will provide good drainage, but if the soil is high in clay you will want to dig the hole deeper in order to put one foot of gravel in the bottom of the hole to provide drainage. If there is not adequate drainage the root ball may drown. It is extremely important that the root system have aeration. Trees actually breathe down the trunk and out into the root system, and if water cannot drain away from the roots, the tree can't breath. Remember, too much water can be just as detrimental to a tree as not enough.

Every specie of tree is different and some trees can tolerate a lot of water, for example Willows and Cottonwoods, but each specie has a time in which too much water will kill the tree. Some take only days, others may survive for months or years with too much water. It is interesting how some species adapt to too much water. The Catalpa tree for example has the ability to send up shoots that act as breathing tubes so the tree can breathe until the water subsides. At that point the shoots retreat back into the ground and function like normal roots again. Some trees have an amazing ability to adapt to adverse conditions.

We have a couple more important things to go over regarding this large transplanted tree. One of those is trimming. Because the tree may have lost a good percentage of its root system when it was dug up, a similar percentage of the upper foliage of the tree should be trimmed off. This is because there is no longer enough root system to support all of the branches and leaves on the tree. This trimming is best done prior to removing the tree and will actually makes it easier to move. There will also be less evaporation and drying out of the tree while moving. If you feel that not much of the root system was lost when it was dug up, then you may not have to trim much out of the tree, but if you have severed a lot of the root system, you will need to cut the upper part of the tree back to compensate for that.

Another issue to consider after the tree has been transplanted is a way to secure or stake it down so that it doesn't blow over.

After making sure the tree is straight in the ground, there are a couple of ways to accomplish the staking and securing of the tree that have worked well for me. The first is to use a cable and run it through a piece of garden hose and then clamp it in a loop around the tree using cable clamps. You will want to make the loop large enough around the tree to allow the tree to grow and not get strangled by the cable. Position these cables – I will usually use three – a little more than half way up the trunk of the tree. Make sure you have enough cable to reach fifteen feet or so away from the tree. Once you have the cable and garden hoses secured around the trunk of the tree use a six or eight foot metal fence post to secure the cable to the ground. These posts are very strong and stay in the ground very securely. The first thing to do is to cut the fence post in half and then drill a hole through it about two inches down from where it was cut. Then, go out ten or twelve feet away from the tree and drive the post into the ground at a 45-degree angle pointing away from the tree. Run your cable through the hole and pull it tight then loop the cable back around and secure it using two cable clamps. I do this from three directions around the tree so it will be supported from three directions. I also leave a tail of cable about four or five inches long after clamping it through the hole in the post. I do this because I then pound the post all the way into the ground so that it cannot been seen except for this little tail of cable sticking up.

Once you have all three of the cables attached and pulled tight so that the tree is held straight and upright, you should tie some pieces of colored cloth to the cables so they can be seen. This will allow you to see them easily as you mow or allow children to see them as they are playing in the yard.

This is not the most beautiful way to stake a tree and if you want to do something more pleasing to the eye, you will want to use a different method of staking. Another method would be to use large cedar posts instead of the metal fence posts.

Another point about staking trees is that you don't want to leave them staked for a long period of time. One or two seasons at the most. This is because the tree will actually be weaker the longer it depends on outside support. The root system needs to be able to feel the tree moving in the wind to develop strength.

I recommend wrapping the trunk of the tree with tree wrap, a material used to wrap the trunks of trees to protect against sunburn, insects or other damage. Young trees and trees that have been transplanted have tender bark so it is good to protect the trunk with this tree wrap. There are several types available at home improvement stores and nurseries.

It is also very beneficial to use a type of tree shield that protects the base of the trunk from weed eater and lawn mower damage. In my work over the years I have noticed how many trees are killed as a result of the trunks being girdled with weed eater damage and I think it is a real tragedy. It is probably the cause of 75% of tree deaths. Places that have

landscape companies come and mow their lawns are often subject to having their valuable trees damaged in this way. Therefore, it is important to protect the base of the trunk either by removing the sod around the base of the tree or installing a tree shield.

You can buy these shields at home improvement stores and nurseries, or you can make them yourself. To make the shields yourself, take four or six inch PVC pipe about a foot or so in length and split it down one side. You can then take this and place it as a covering around the base of the tree. For larger trees you can use corrugated PVC. Corrugated PVC is more flexible and it also has holes in it allowing the tree to breathe better. It is important to periodically pull these tree shields up and clean under them. Insects will like to make a home out of them so pull them up occasionally and pull out any debris or bugs, but use these shields because the chances of weed eater blight is far greater than the chances of insect infestation cause by the shield.

Tree Repair

Structural Damage and Surgical Techniques

Whether trees are in the forest or in urban environments, like all other living organisms on this planet, they are in a constant fight for survival. In the forest setting trees are a source of food for moose, deer, porcupines and many other bark eating animals. Insects like borers and beetles attack and distress them. There are viruses, funguses and many other diseases that attack trees. Sometimes they are in a fight with other plants as well, such as vines that choke them. But even with all of these issues trees in the forest are able to thrive and flourish because of the one thing trees in the forest setting have that trees in urban environments don't have. They have an over abundance of fertilization.

This fertilization comes from the constant dropping and shedding of leaves, twigs and other material that create a natural compost that develops under the canopy of forest trees. Over time this develops into a tremendous nutrient base that helps them to flourish and grow and mature. Trees in the forest age, fall over, rot and decay and all this turns into natural fertilizer. All of these things happen in the forest but just the opposite occurs in the urban environment.

In the urban setting trees are planted in parks and yards and parkways and various other places. But, in the fall when all of the leaves are shed, the first thing that man does is rake up those leaves because he thinks they are unsightly. The fruit that drops and the twigs that break off and fall to the ground that supply natural fertilization are all picked up and hauled away. So over time the tree does not get the natural fertilization that it needs. As a result trees in urban environments suffer from malnutrition and this in turn leads to disease and insect infestations.

Another major threat to trees in urban environments is what I like to call mechanical blight. Mechanical blight caused by the instruments of destruction such as lawnmowers, weed-eaters, and motorized vehicles of every type and even chain saws that do a great deal of damage to trees. Every year I fertilize and repair hundreds of trees and I would dare say that the largest percentage of damage I see is due to mechanical blight.

Lawnmowers and the damaged caused by them for instance is something I see often. Lawnmowers are typically driven like cars nowadays and they are driven around the bases of trees. The person driving this lawnmower wants to get close and get the grass growing at the base of the tree. The metal grinds against the tree and as they pass it destroys the layers of bark at the base. Over time as this process is repeated over and over eventually the bark is worn through to the layers that carry nutrients up the trunk. I often see dead trees on commercial properties that died as a direct result of this type of preventable damage.

Weed-eaters basically do the same thing because the person operating the weed-eater tries to get close to the base of the tree to trim the grass. As with the case of the lawnmower, over time and repeated injury, the tree bark at the base of the tree is

completely worn away down to that layer of bark that carries water and nutrients up the trunk. If this damage happens all the way around the base, this girdling of the tree trunk will cause the tree to die.

Trees planted in parking lots and parking strips often suffer similar damage because of car bumpers that repeatedly hit trunks of trees and over time produce the same type of damage.

Chain saw damage is caused mainly by someone operating the saw, who does not know what he or she is doing. They either cut off limbs too close to the trunk or they cut it off too far away and leave a long stub and the stub dies back. Any time dead material is left on a tree it is an invitation for insects and disease. They cut into the tree and leave openings where again it invites insect infestation.

Four main types of mechanical blight are - lawnmowers, weed-eaters, automobiles, and chain saws.

Other problems occur that are not related to mechanical blight but are extremely detrimental to trees and I'll name a few of those things.

One of those for instance is lightning. Lightening doesn't happen that often, but when it does happen it does an extreme amount of damage. I've seen trees where one whole side of the tree has caught on fire. I've seen trees hit by lightning where the tree has been split or the bark has been split down one side of the tree. I've seen cars that have caught on fire in parking lots and caught adjacent trees on fire. But often this damage has not killed the tree and in many cases the tree can still be repaired. And it has amazed me how many times, and how quickly, a tree will recover from severe damage. Trees don't always need to be cut down when they are damaged.

Another major cause of tree damage is insects such as borers and beetles. These insects can do an extreme amount of damage. Termites are another one. Over time termites can literally hollow a tree out.

Wind is another element that damages trees. Wind can rip off large and small limbs and leave holes and tears in sides of trees that need to be filled and repaired. Sometimes if a very large limb gets torn off it will tear one whole side of a tree off. Also heavy snow can do a great deal of damage to trees.

There are situations where a tree simply has a weakness in the crotch where the first branches come off from the main trunk. It had that weakness from when it was young and as the tree grows and matures, these lateral limbs develop and grow heavy and they can begin to split the tree in half. This is not a reason to cut the tree down. This damage can also be repaired. As I will explain further as we talk about tree surgery, I will explain how to repair all kinds of damage to trees.

Another potential problem that at first thought may not seem to be a problem, is water, especially water that gets into openings in the crotches of trees. If water accumulates in these openings it will begin to cause rot and decay. Foreign matter and insects get in there and in the space of a few years can cause large cavities to form. These too can be cleaned out, sterilized and can be filled in such a way that it will drain the water off. As long as the main lateral limbs are secure and they are not deteriorated to the point that they are in danger of breaking off by snow or wind, this damage can be repaired. Even in the event that limbs are in danger, it is possible to place cables up in the tree and pull them together and support the weight of these limbs until they have a chance to grown strong again.

Bark Wound Repair

Bark wounds where the outer bark has been torn away and has exposed the cambium layer and even the heartwood, are situations where the tree needs to be treated and repaired. Because again, any time there are openings there is the potential for insects and disease. The treatment of bark wounds is normally quite simple. Using a sharp knife and a medium size chisel you can cut back the bark edges around the damaged area to the shape that is pointed at the top and at the bottom. Sort of like a flying saucer turned up and resting on its edge. This shape allows the sap to flow along the edges of this newly cut shape in such a way that the wound will naturally begin to grow back together and heal the wound.

The newly cut edges should be painted with orange shellac to prevent it from drying out and this should be applied along the edge of the newly cut shape down to the exposed heartwood. The next step is to apply antiseptic tree paint to the inner part of the wound. Do not use house paint or regular spray paint. These are not satisfactory in this particular situation. It should be paint with an asphalt base. This kind of paint is specially prepared with fungicide or antiseptic ingredient and is generally made specifically for trees. This kind of paint can be purchased at home improvement stores like Lowe's and Home Depot or at nurseries. Later in the book I will list other products that are not necessarily made specifically for trees that I use in my business that I'd like to share with you.

With regards to the shaping of this wound - I want to emphasis this because it is important to the healing of the wound. The original wound may be in any haphazard shape, but you want to use your knife and/or chisel to reshape it to where it is pointed at the top and at the bottom. Some wounds are difficult to shape in this way. Wounds caused by car bumpers or weed-eaters that are wide but not tall are hard to shape in this way. But you want to do it the best you can because the wound will heal much faster with this shape. You can shape a wide wound with the points on either side but just make sure you make clean cuts and then apply the shellac and paint and seal it and over time it will heal. Some wounds may take years to fully heal and you may have to re-seal them periodically, perhaps every six months. Check the progress from time to time. The real purpose of this is to keep water and air from deteriorating the wound further so the treatment includes periodically checking to make sure the wound stays sealed from the elements.

Cavity Filling

Now let's talk a little more about cavities. What is a cavity? A cavity is any hole, large or small, on a trunk or a limb occurring in the heartwood or sapwood or both. A perfect tree presents an unbroken bark surface. Any opening in the bark surface that penetrates through the first layers of bark is considered a cavity. It's interesting how cavity repair came about. The whole field of arboriculture dates back for hundreds of years and the term "tree surgery" has been with us for a long time. During the early 20th century, from the teens up through the 1940's cavity repair and tree surgery were very sought after skills. There were competitions between the wealthy to see who could have the biggest cavity filled in their prized trees. This was sort of a fad up until the Great Depression.

There are numerous ways and techniques to perform this type of work. Some of these processes date back to the 1600-1700's from France and England. Even back then the filling, grafting and shaping of trees was very important to the wealthy who prized and took great pride in their trees. The techniques were extremely important and closely guarded secrets and that is why the individuals who had these skills, called Tree Surgeons, were very sought after and were paid handsomely for their services.

With that little bit of history, lets talk about the filling of a large cavity in a tree and what it entails; namely, the spraying, swabbing, draining and filling. First I want to say that there are some cavities that should be left open, and should not be filled. One of the reasons to leave a cavity open is if it is too shallow. Perhaps is can just be sprayed with some good quality tree paint to keep it sealed off from the water and air. Another reason not to fill in a cavity is if it does not catch water. If an opening is vertical or for some reason water won't stand in it, it can be cleaned and sealed and eventually it will heal over. Yet another reason not to fill a cavity is when it is healing over by itself, and perhaps it is almost already healed over. In that case nature has taken care of her own so perhaps just seal it with a good tree paint.

Another consideration when deciding to fill a cavity is movement. For instance if you have a cavity that is up high on a limb that moves in the wind, it would be difficult to fill that with concrete or other filler and have it stay together. In other words the constant movement would perhaps work the filler loose and would create cracks and openings that would allow water to get in anyway.

Finally and perhaps the most important reason not to fill in a cavity is if the tree is in a declining state. If it's not doing well then filling isn't likely to improve the trees health. In that case it is perhaps better to save the expense, your energy and time.

There are times when filling a cavity is worth the effort and expense.

The first reason to decide to fill is that the cavity is large and deep and it's a valuable tree. In that case you can really justify filling this cavity in.

The second reason would be if you could secure the movement and keep the filler in a rigid position. A cavity that is up higher on the tree let's say in a major crotch can in some cases be secured against movement by structural repair or cabling the branches.

The third reason to fill in a cavity is if there is an opening that has water being continually poured into it. There will be deterioration of the tree at that point and filling it would be advisable.

The forth reason would be if there is a ground line cavity, that is to say a cavity that is in the trunk of the tree down close to the ground or extending all the way to the ground. Sometimes these are openings caused by lightning or something that hit the tree years ago. The water has run down the trunk of the tree and over time has seeped into this opening and has rotted the tree out. I have seen cavities where the whole inside of the trunk of the tree has been rotted out, and after they have been cleaned out, they were big enough for me to stand inside of them. So, that's what I mean by a ground line cavity and that type of opening definitely needs to be filled.

With that preliminary information we can reveal the process and what needs to be done to fill it.

The first thing is to have the tools you will need to perform this surgery. There are three or four tools you will certainly need. The first one is a medium sized mallet or hammer. You will need a large, medium and small chisel. Sharp ones preferably. You may need a hatchet. You can use anything that will remove the decayed inner wood from this cavity. You will also need a mason's board and trowel.

Start at the top of the opening and begin to remove the dead and decaying material until you reach the good living wood inside the cavity. It is important that you clean the inside of the cavity out so that the inside of the cavity is a larger area than the actual opening. This will make it so that when you fill the cavity with concrete it won't be able to just fall out. It's the same principle a dentist uses on a cavity in a tooth.

The first thing you need to do before you begin to fill the cavity with cement is to sanitize and disinfect the inside of the cavity. What I recommend using is a Borax powder mixed with either water or linseed oil. Spray or brush this mixture inside the cavity. And this mixture kills the bacteria and infections inside the cavity so that once the concrete is packed in there will be less chance of fungus or mold or some other decay occurring between the live tree tissue and the concrete filler.

I've mentioned concrete, but let's consider the mixture and products that can be used to fill in the cavity.

Large cavities are going to need to be filled with a concrete mix. You can buy pre-mixed or you can mix it yourself. The formula for mixing it yourself is two parts of sand to one part of cement. You can mix this in a wheelbarrow and begin to get an idea of how much you will need to fill the size cavity you have. If you need more just keep adding in that

ratio – two parts sand to one part cement until you have enough to fill your cavity. You want to mix this dry. Don't add water until you have enough dry ingredients mixed together to fill in the cavity. When you add the water you need to make sure that it is a consistency that will stay vertically in the opening. If you mix it too wet it will just flow back out. If it is too dry it will be hard to push it up into all of the little crevices and uneven areas inside the cavity.

If you don't want to mix the concrete yourself you can buy a product called Mortar Mix. It is very easy to use and comes in 25 or 50 pound bags. You can buy this at Lowe's or Home Depot. What you do not want to use is Sacrete. Sacrete is not appropriate to this application.

A product you can use for small cavities, that is cavities that are no more that two or three inches deep, is called Plastic Roofing Cement. It's very flexible, durable and water-proof. I use this product in various other treatments as well that we'll talk about later.

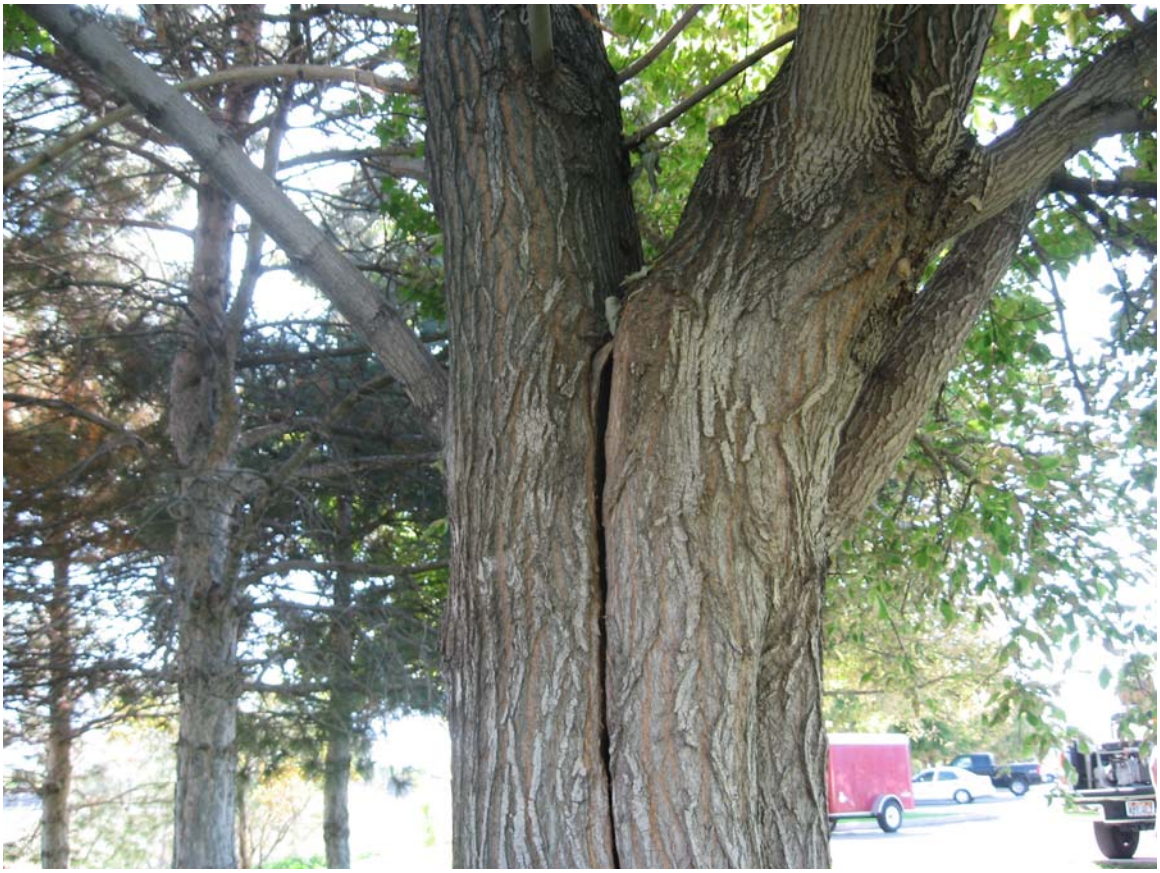
When I get to the point where I'm putting the mix into the cavity I use my hands and push this material into every crack, crevice and opening inside the cavity that I can. You must not have any air pockets between the inside wall of the cavity and the concrete. Pack it in just like a dentist would when he is filling in a tooth. After it is packed into the cavity you can use a mortar board and trowel to finish and create a smooth surface.

Once you have the cavity almost filled in, you want to make sure that the concrete does not cover the cambium and sapwood layer. This is so that the tree as it grows can grow in over top of the concrete. And given enough time the tree will completely grow over the concrete. That is your purpose and aim with this process, to fill in the cavity and then have the tree grow back over it.

I also like to color the concrete. It just looks a lot nicer and is less noticeable if you add a dye to the concrete. I like to use black.
Another consideration that is important is the expansion and contraction of the concrete as the seasons and temperatures change. Making expansion joints using roof shingles has worked well for me. I simply take a piece of asphalt roof shingle the width of the opening I have just filled in and about 6 or 8 inches deep, and push this into the wet concrete until it is flush with the surface. I may use two or three depending on how large the repair is, and they can be inserted either vertically or horizontally. If the repair is small this may not be necessary.

Split Tree Repair

Sometimes tree trunks and branches split. This happens when it reaches a certain stage in its growth and typically occurs at a crotch. As the tree branches grow and get heavier the weight converges at the general crotch and a split in the trunk begins to form. It may be that a heavy snow with its weight split the tree. Or it could have been the wind blowing a heavy branch back and forth over time began to split the tree.



This problem can occur in any crotch. It could be up high in a large tree in the crotch of two branches, but it frequently occurs where the first lateral limbs grow out from the main trunk. There are some species of tree that are more susceptible to this condition than others. Willows, Sumac and Cottonwoods are softwood trees that come to mind, that have this tendency. Trees that don't have this tendency would be hardwood trees such as Oak trees. Elms, Box Elder, Mulberry and many others exhibit this tendency and many people will run in to this problem in their trees. What I would like to do is help people understand how these splits can be repaired.

For example, you have a Mulberry tree that has two main branches at the main trunk and because of the weight of these two branches a noticeable split has started there. It is plain that if this condition were to be left alone the tree would eventually split right down the middle of the trunk. What I'd like now to describe is a way to pull this split back together and bolt the tree together. As a result of this intervention the tree will grow back together.

The first thing that needs to be accomplished is to pull these two halves of the tree back together as tightly as possible. How we do this is to go up into the tree where there are two good sized limbs, one on each side of the tree. Once you have determined the two branches you secure a rope that won't stretch too much, and I like to use a poly line for this, around each of the two branches. Attach these ropes so that you can get a hook under the line. Then take a come-along and hook one hook to each rope (come-alongs have a hook on one end and a hook attached to a cable on the other end) and then begin to ratchet this come-along until the branches begin to pull together and the split begins to pull together. As you ratchet this come-along make sure that the ropes a secure and that the hooks are secure so nothing will come loose and hurt you. Once you have these two branches pulled together and the split in the tree pulled together you just leave it this way and come back down out of the tree.

Drill a hole at the point that will be most beneficial to place a bolt or bolt stock (threaded rod) through the tree in order to hold this split together. You would use a brace and bit or a long auger bit to do this. Depending on how big the trunk is and how big the split is will determine the size of bit you will use, anywhere from 3/8 to ½, or even one inch diameter. It just depends on the size of the trunk and the size of the split.

Ideally you should drill two holes, one up at the top of the split and one down about half way. You also want to drill holes slightly smaller than the size of rod you are using, because you will want to screw the rod through the hole if possible. It may not be possible and you may have to pound the bolt through, but if you can screw it all the way through the tree it will be stronger and hold the tree together better.

Once you have these holes drilled you insert a threaded rod through the hole so that it will come all the way through the tree. Once it is through the tree you should prepare one side of the rod completely by countersinking around the rod and placing one or two washers and a nut on that side. If you don't do this it will be hard to finish the other side. You want to end up with the rods flush with the outer bark on either side of the tree. First on one end of the rod, you take a chisel and square out around the end of the rod or bolt deep enough and wide enough so a washer and nut can be placed on the end of the rod and when it is screwed down tight, it won't extend beyond the outer bark of the tree. You should also chisel out around the rod so washers and a nut can be countersunk below the outer bark on this side. Then place the washers and nut on this side also and tighten them down. Now you can cut the end of the bolt off so it is flush with the tree. Leave a thread or two sticking out past the nut. Once you have the nuts screwed down very tight on both sides of the tree, take a sledge hammer and have someone hold it against the end of the bold on one side. Then on the other side take another hammer and beat the end of the bolt that is sticking out past the nut, so it folds down against the nut. This is done so that as the tree moves in the wind these nuts won't work themselves loose. Do this procedure on both ends of the bolt. One other note about countersinking around these bolts – I sometimes use a square washer because they are thicker and will hold better in the squared out hole around the bolt chiseled in the tree.

When all of the bolts are tightened and countersunk and the ends of the bolts are beat down so they can't come loose, they can be sealed off with Plastic Roof Cement and eventually the tree will grow back together over the ends of the rod and you won't be able to see where the bolts were placed.

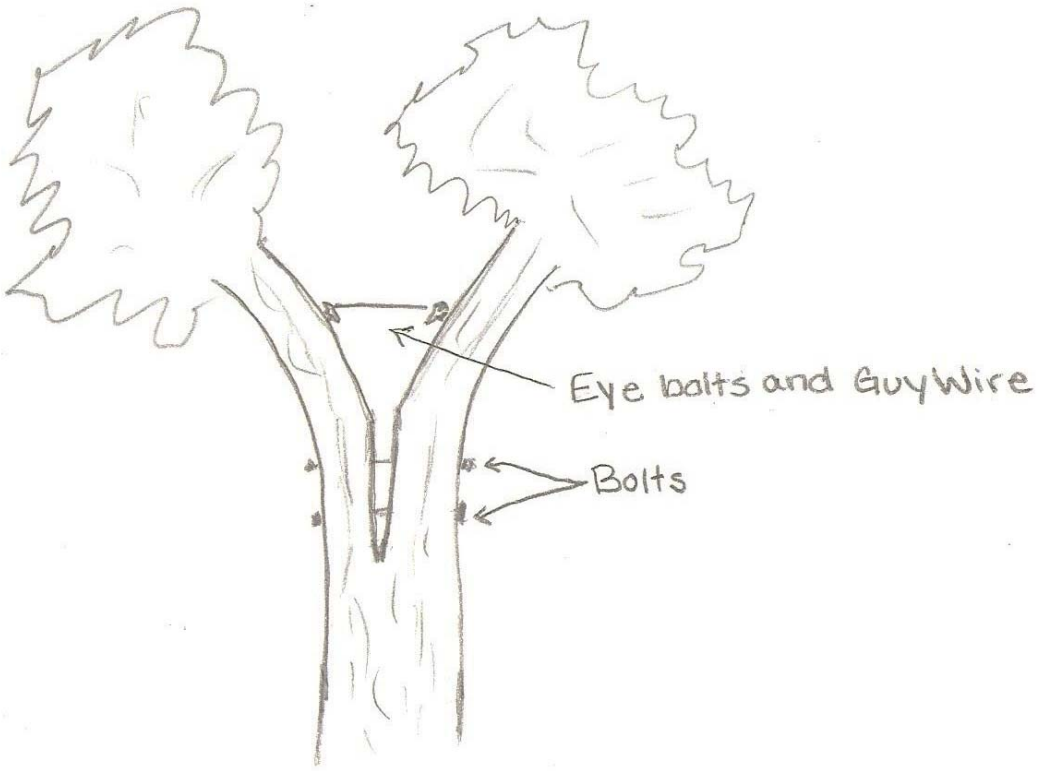
Again it is usually best if you can place two bolts through the tree. It will be much stronger if you do.

Once your bolts are in place, your come-along is still up in the tree holding it together. At this point you will have to climb back up into the tree and place a cable to hold the tree and give support as the tree moves in the wind. Depending on how the limbs are configured you may even want to place two cables in the tree to hold it together while the split is healing.

In the vicinity of the come-along that is in the tree holding the limbs you can screw in lag I-bolts to hold your cable. If you wanted to you could also drill a hole through the limb and put I-bolts through that and have a circle on one end to attach your cable to. Based on your determination of the size of the limbs and how strong you feel these cables need to be, select the method of holding the cable and the size of the cable. Cable comes in many different sizes and if these are very large limbs you want to hold together you should use a larger cable.

Once you have the I-bolts secured to the limbs and you're ready to string the cable, attach the cable to one of the limbs. I like to use U clamps and on one side run the cable through

the loop in the bolt and clamp it tight. Then have someone string the cable through the other side and pull it as tight as possible and clamp the other side. Then you can remove the come-along and the cable will be in place to hold the limbs together.



The purpose of the cable is to insure that the split in the tree isn't pulled apart again by the movement of the limbs in the wind. And so installing these cables is a crucial procedure to the successful healing of the tree. These limbs can also be pulled together by using a turnbuckle. A turnbuckle has a bolt with a loop on each end and these bolts are threaded into the turnbuckle so that when you turn or twist it with a crescent wrench, both bolts are tightened or loosened simultaneously. And so when you have the I-bolts installed on the two limbs you want to pull together, you can place this turnbuckle in between them and then as you turn it, it will pull these limbs together much tighter than you could have done by merely pulling by hand.

The disadvantage to the turnbuckle is only perhaps the fact that it will be easily seen up in the tree, whereas the cable by itself may not be noticeable from the ground. But there are cases where it is advisable to use the turnbuckle to make sure the limbs are held tight. But you don't want them too tight because the limbs still must be able to move in the wind to a certain extent otherwise they may break of in a very strong wind. So there is a judgement that you must make as to how tight it should be. Tight enough to hold the split together, but loose enough to allow some movement of the branches in the wind.

Once you have the limbs pulled together and thus the split in the tree pulled back together, and perhaps you have also drilled through the main trunk and installed bolts to hold the split together, you will still notice that there will still be a crack wide enough for moisture to seep down into. It is critical that this crack be sealed up in the crotch of the tree and also down both sides as far as the split occurred. In order for the tree to heal properly moisture must not be allowed to get down into whatever cracks or openings remain. The best product I have found to seal these cracks is the plastic roofing cement. There are other more expensive products that don't work as well. I have used the plastic roofing cement with great success for years. You should check periodically to make sure the openings remained sealed and reapply the cement as needed.

One other thing to consider in this process of repairing a split in a tree is that after you have bolted the tree together and installed cables up in the tree to hold the tree from splitting again, you may want to do some selective trimming to remove some of the weight in those branches that are held by the cables. By removing some of the weight it will help keep the tree from being pulled apart again in a strong wind. It really just depends on how big the tree is. On a smaller tree with small branches this may not be an issue. What you don't want to do is change the outer shape of the tree, but just take a few of the inner branches off to reduce the weight.

Structural Grafting

Bridge Grafting

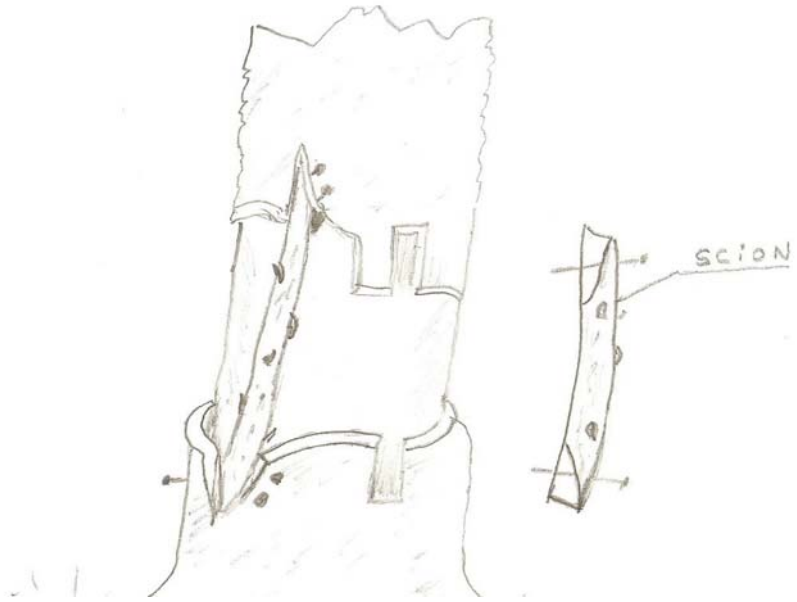
Trees are often damaged around the base of the trunk by weed-eaters or lawn mowers. Over time, if this damage is not stopped, a tree may loose all of the bark around its entire circumference. This is a condition known as girdling. If left untreated this will greatly impair the trees ability to survive and does often result in the death of the tree.

The method to treat this condition that has worked best for me is called inlay bridge grafting. This technique works great on trees that have been girdled. In fact, it is a necessity for a short span.

Select a curved scion or limb to make an inlay bridge. Measure the distance to be spanned and make sure the scion is long enough to extend 1½ to 2 inches beyond the girdle on each end. Cut a smooth straight face on each end and drive a nail in each end as shown in the picture. After that tack it lightly to the tree bark to mark the spot to be cut with the right size and shape as the scion. Cut channels extending beyond the girdled area for the scion and then nail the scion in place. One nail should generally be enough.

Place a scion about every two inches around the tree and then cover the unions with asphalt grafting compound or wound dressing. Make sure the entire girdled surface is covered; which might require more that one coat.

After the scions begin to grow it is very important that all shoots or leafy growth be removed from the scions.



Standing Up Trees Blown Over by the Wind

Next, we will discuss the way to stand up a tree that has been blown over by the wind. This usually happens when a strong wind occurs from the opposite direction of the typically prevailing winds. It often happens to pines or other trees that are very dense in their foliage. It may be a good idea if you live in an area with frequent strong winds to thin out some of the limbs to allow the wind to pass through the tree. Trees with very dense foliage can act like a wall when the wind hits them and by thinning out branches every few feet up the height of the tree, you may prevent it from being blown over. When tree thinning is done by an experienced person, it can be done in a way that you really don't see a difference in the appearance of the tree. Many times people assume that if a tree has been blown over then all one can do is cut it up for firewood. When I see this it makes me ill because these are usually still beautiful trees that are thirty feet tall or more, and many of these trees can be saved.

There is a process that can help you save the tree. The first thing you will need is what I call a deadman. A deadman is a truck or another tree or some other fixed object that you can attach a winch or a come-along to in order to pull this tree upright again. There have been times that I have not had anything I could put in position as a deadman. I didn't have access to bring a truck in to act as my deadman and there were no trees or other objects I could use. I was still able to accomplish this by driving large stakes into the ground to provide that deadman I needed. You must be sure and make certain your deadman is strong enough to hold the weight of the tree while it is being pulled upright.

Once you have a deadman in place you will need to hook onto it somehow. One way is to use a clevis, which is a half round loop of steel with a bolt through the open end. For example, if you are using another tree as your deadman you could wrap some heavy chain around the tree and then use this clevis to attach your winch or come-along to. If you do use another tree as a deadman, you will need to protect that tree's bark by wrapping it in burlap or heavy rubber before wrapping a chain around it.

If you are using a come-along you will need one rated at 2000 to 2500 lbs. of lift, so that you can ratchet the tree up off the ground. Come-alongs can be rented rather inexpensively and work well because you can ratchet the tree up slowly. You do have to be careful how you attach the chains or cables because as you lift the tree up and a great deal of weight is on them, if they were to come loose the chain or cable could whip back and hurt you or someone else. It is a good practice to wear a hard hat, eye protection and also to wear a long sleeve shirt or jacket that can protect you a bit in case something breaks loose. Just keep in mind and be very careful to attach your chains and cables securely.

The come-along will usually have a cable about ten to fifteen feet long. This cable pulls out and has a hook on the end. This is the end that will attach to the tree. The other end of the come-along has a hook as well and this is the end you will hook to the clevis that is

attached to your deadman. You hook up to your deadman, and then pull out as much cable as you think you will need to pull the tree into an upright position. I like to use a good 5/8-inch poly rope to attach to the tree. I do use and recommend a poly line as opposed to a nylon line because nylon will stretch and if it breaks it's very dangerous. I attach this line at a position toward the top of the tree, but low enough so that the tree won't break as you pull it up. I also tie the knot so that it doesn't cinch up tight as I pull; leaving enough of a tail on the rope so that I can pull it from the ground to untie the knot once the tree is upright. This way I don't have to climb up the tree to untie the knot or cut the rope after I stand it up. The knots I use to do this are either a bolin or a clove hitch.

At this point attach the hook on the cable that pulls out from the come-along to the rope that is secured to the tree and begin to ratchet the come-along until the cables are pulled tight. Double check to make sure everything is attached properly so that nothing comes loose and then just keep ratcheting the come-along until you pull the tree back to a straight up position. . Before you pull the tree upright it's a good idea to saturate the ground with water so that once the tree is upright again it can settle back into place more easily. It is a pretty simple process and once you get everything set up properly you can generally pull the tree upright quite easily. Depending on where the tree is located you may be able to pull it up using a pickup truck or you may be able to use a winch also. You could also use a pulley attached to a deadman in place of a come-along, and pull the tree up using a pickup. The main thing is to get the tree roots back into the original hole. With that done, you can ad more soil or replace the sod if needed

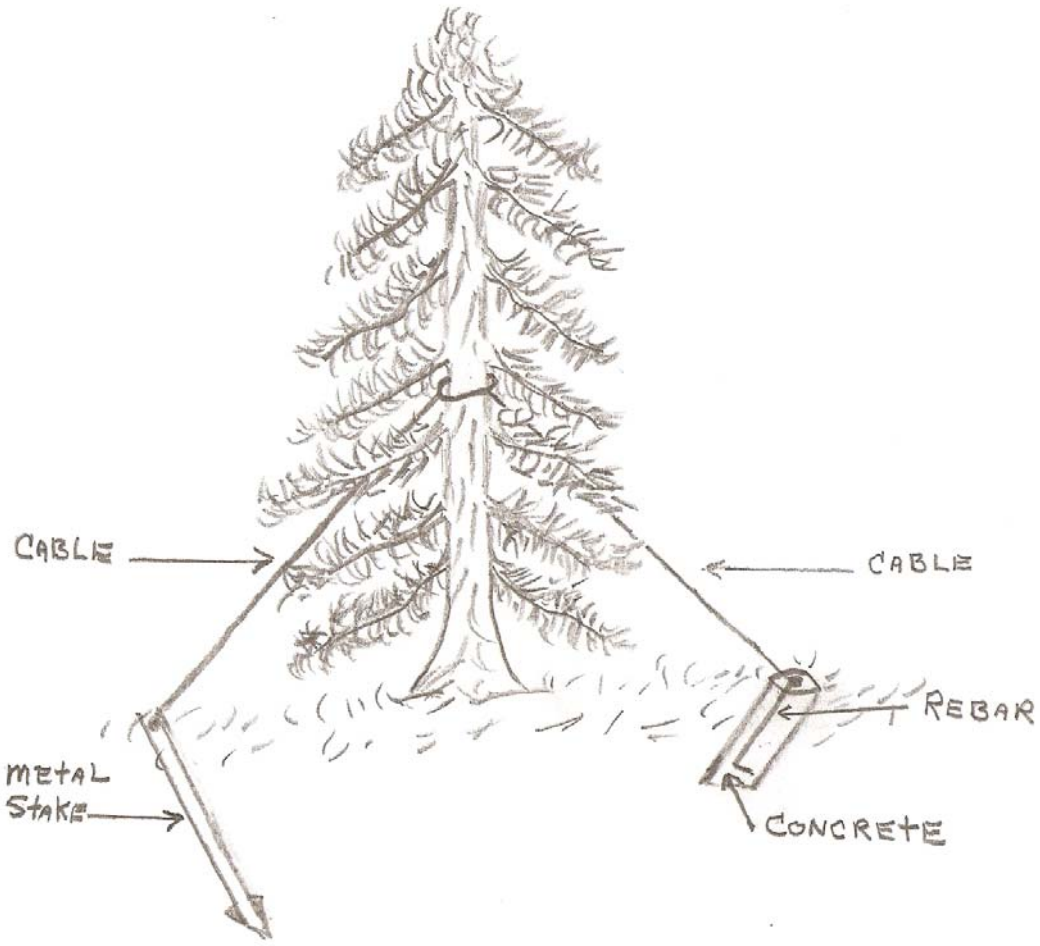
Once you have the tree back upright it is time to stake it down so it doesn't blow over again. I have stood up hundreds of trees and can only think of a couple times I have had to stake it more than twice. One stake is generally enough, but it also depends on how severe the damage to the root system was. The root system on the side of the tree in which direction it fell, is usually still intact and strong in the ground. What the tree requires then is to be staked so it doesn't fall over again in that same direction. This can be done typically with one stake. On a larger tree however, I would use two stakes and sometimes if it is very large, I will use an anchor in addition to the stakes. I will describe this anchor later.

I use the metal fence posts the same way I described earlier only with larger trees I try to pound the whole fence post into the ground. If it is a smaller tree I cut the fence post down a bit since it is difficult to drive a six or eight foot fence post all the way into the ground. Again, I drill a hole a couple of inches down from the top end of the fence post large enough to accommodate the size of cable I intend to use. If it is a very large tree I may use as big as ½" inch cable, smaller trees I use smaller cable. 7/16" to 3/8" is usually large enough cable to hold a pretty good size tree. You now stake the tree in exactly the same manner I described earlier, pounding it into the ground on about a 45 degree angle and using the cable clamps and garden hose etc.

As you will recall when I put the cable around the tree it goes through the garden hose in a large enough loop so that the tree will have room to grow. When a tree blows over, it may take two or three years for the roots to reestablish themselves. You want to allow the

tree to grow during this time. Also remember that you need to leave a tail of 8 to 10 inches and use adjustable cable clamps. This is important because in the two or three years this tree will be staked, you want to be able to loosen the cable as it grows. Otherwise, the cable will just get tighter and tighter and will pull the tree in the direction of the stake.

The cable should be very tight initially. I do this by driving the stake into the ground about half way and then attach the cable from the tree and pull it as tight as I can, securing it to the stake using cable clamps. I drive the stake the rest of the way into the ground until it can't be seen. This pulls the cable very tight. In some cases I even add another stake directly behind the first stake. I drill an additional hole in the first stake 6" down from the first hole and attach a cable that then goes back two or three feet to another stake. When both stakes are driven into the ground they become even more secure and will hold the tree in the event of a strong wind. This is why you want to leave that tail on the tree side so that you can loosen those clamps and allow the tree to grow. It may surprise you how much that tree will grow in one season, so be aware of that and check to make sure your stakes aren't going to pull the tree crooked as it grows. Most of the time you can take the cable off completely by the second or third season.



I mentioned earlier an anchor that you can use in addition to the staking. These anchors are placed in the ground using rebar and cement. The first thing is to dig holes about two and a half feet deep using a good sharp posthole digger. Ideally, these holes should be dug at an angle away from the tree and about at the distance you would normally place a stake. Taking about a three-foot piece of rebar, bend one end around in a small circle to attach the cable to. About 12 inches back from the circle, bend the rebar into an L shape. Next place the L shaped end into the hole so the end of the rebar with the circle bent in it can be placed at the surface of the ground. Holding the rebar in the middle of the hole prepare and place cement in the hole. These anchors can be covered with sod and not be seen but will be there if you need them to anchor the tree.

Finally, there is an issue that I consider quite important once you have this tree back upright, guyed and staked. It's important that you use a good quality water-soluble root stimulator. This should preferably be injected into the ground. Injecting makes it much more effective than simply pouring it on the ground around the tree although that is better than not applying any stimulator at all. The root stimulator will help those roots that were broken off when the tree blew over reestablish themselves. The quicker you can get the roots to reestablish the better the tree is going to do in the long run. After a year or so you should fertilize. Again, this ideally should be injected into the ground around the tree at the drip line. This is important so that over the next three or four years the tree will develop a good strong root system so that it doesn't blow over again.

Natural Insect and Disease Control Without Chemicals

Insects and Diseases

In this section you will find a short list of insects and diseases that I personally deal with on a regular basis. I have described the insects and the natural treatments to show that most insects throughout the world can be controlled naturally, without pesticides or fungicides that destroy natural predators and have a negative impact on the environment.

I believe that most of these detrimental insects can be controlled with the natural processes I've indicated in this book. However there are hundreds of insects that are detrimental to trees and shrubs. I have in not attempted to provide a comprehensive listing. Much more information can be obtained on-line at University and County Extension sites.

Shade Tree Borers

There are a great number of beetles and moths that in their larval stage are borers. They have spent one or two years feeding on the inner bark of trees doing great damage, then they cut a hole in the bark and emerge as an adult beetle or moth. A great number of these adult borers, particularly the long horned beetles and metallic wood borers feed on tender bark, pollen or leaves and do not do any significant damage to trees. The adult life is spent flying around looking for a new host tree or trees. Then their goal is to mate and lay eggs. The eggs are laid on the bark usually inside small cracks or holes. Horntails and longhorn beetles deposit their eggs underneath the bark. The borer eggs usually hatch with in one or two weeks.



Adult peach tree borer and damage.

The borer's development takes place just under the bark. As the borers tunnel into the tree they make meandering tracks that are packed with fibrous material and saw dust. While they are inside the tree they do a great deal of damage. They work primarily just under the bark making their tunnels through the cambium layer, which is the layer essential for the tree to bring nutrients up from the roots. Sometimes borer infestations are so bad they completely cut off the trees ability to draw nutrients up from the soil and the tree dies. When the larval borer finally develops to the adult stage they emerge from a hole chewed in the bark and start the process all over again.


Metallic wood borer adult and larva

Longhorn beetles are named for their very long antennae. Metallic wood borers are named for their metallic sheen. Generally green, bronze or blue, but brightly colored species can occur. The larva are known as flathead borers. There is also one called a Lilac Ash Borer that flies from April through June and is extremely detrimental to small ash trees.

If you see sawdust or a wet fibrous mixture coming out of holes in your tree you can pretty well figure that you have a borer problem. So I want to list some treatments for borers. Some I list will are ones that I have not used but I've used most of them personally in my work with trees.

First of all in young trees you can prevent borer problems by painting the trunk with a latex paint or whitewash. This will deter borers from entering into the trunk in the first place. Secondly, you can use Moth Crystals. These Moth Crystals are used primarily for peach tree borers that attack the lower part of the trunk. The larva starts in the ground and then they come up into the lower part of the tree. So you can add these Moth Crystals to the ground to prevent peach tree borers. These are toxic so make sure they are buried in the ground so pets and kids don't ingest them. But they will control peach tree borers. If you have borer holes higher up on the trunk you can also take these Moth Crystals and break them up into smaller pieces and push them up into the borer hole. Wear some latex gloves and just use a pencil or some other tool to push these crystals up into the borer hole. After you have pushed these crystals up into the borer hole as far as you can, then seal the hole up with plastic roofing cement. This is the same roofing cement that I've mentioned in previous chapters and this can be found at your local home improvement store.

This next process is one that I have never done personally, but I thought I would just mention it because it is probably worth a try to deal with borers that had just begun to

infest a tree and had not gotten very far into the tree. What you do is take a flexible wire and push that up into the borer holes and simply stab and kill the borers that way. And again this would have to be done at the first sign of entry into the trunk, because these borers turn back and forth as they bore into the tree and once they had mad a couple of turns this method would not be effective. And again once you had killed the borers you will want to seal the holes with roofing cement.

Another method to treat a borer infestation is to inject into the borer holes a liquid solution with a parasitic nematode. And once again you need to seal up the borer holes once you've injected this solution. This parasitic nematode can be purchased at any good quality nursery or landscape supply house. Follow the instructions carefully and wear rubber gloves and eye protection.

I want to discuss some methods I use to inject these borer holes. Depending on the material you have at hand, there are two or three different ways to inject. One way that I have not done personally, but that I have heard of being used, is to simply use a plastic honey bottle. These bottles have a tip that is narrow at the end and so would fit into the borer hole. Then fill it with the solution and squirt that up into the borer hole. I didn't feel like this method would get the chemical very far up into the borer hole. It may work if the borer is still close to the opening, but usually the chemical needs to be injected further up into these holes so that it can get pasted the sawdust material that is produced by the borer tunneling into the tree. Once the chemical is injected far enough up into the hole it is absorbed and then the hole is sealed over. The fumes from the chemical will travel up the tunnels and kill the borer larva.

Another method is to use a metal oil-can with a plunger. And these have a flexible tube that comes out of them and they have a metal tip that fits very well into borer holes. So then you would put your chemical into the oil-can and then use that plunger to push it up into the borer hole. And this works fairly well. And if you have an old oil-can and you don't mind cutting that flexible tube off of it, you can attach that tube to a plastic pump sprayer. Sometimes the tube from the oil-can will fit inside the hose of the pump sprayer.

The next one is the one that I have developed and that I use to inject borer holes. This device has worked very well for me over the years. This fitting is pointed and works very well to be able to inject right up into the borer hole. And fortunately it is the exact same size and thread as the tip end of most pump sprayers. So typically you can just remove the threaded tip off of the pump sprayer and screw this fitting on the pump sprayer. These are inexpensive and can be purchased from *Healthy Trees For Life.*

I also take a thick, round piece of rubber about one or two inches in diameter and punch a hole right in the center of it, and then put the tip of this fitting through that piece of rubber. And what this does is keep the liquid that I'm injecting into borer hole from squirting back into my face. And so this set up works wonderfully to inject borer holes. These little plastic pump sprayers have the right amount of pressure to get the liquid up into the borer hole and the tip I use with the rubber splash-guard works extremely well. And once again remember that once you have injected the chemical up into the borer

hole, you need to seal the hole with plastic roofing cement. You will find that within a short period of time after the borer is dead that the tree will push the dried roofing cement out of the hole and it will be healed over.

Another product that I use to get rid of borers that works really well is a systemic. This is a liquid drench that you mix and pour around the base of the tree. The root system will then draw it up systemically into the structure of the tree. As the borers inside come in contact with the chemical as it is drawn up through the cambium layer they are killed. This can be used in conjunction with the injection to treat heavy borer infestations and does a very good job of controlling the borers.

This systemic product is called Merit. This product can purchase at a pest control supply house. It sometimes has different generic type names but it is still the insecticide Merit. It can be purchased in a product made by Bayer and you will find this in all of your garden centers. Just look on the label of the product made by Bayer and you will see that it contains Merit. Normally I use natural pest controls, I don't like to use insecticides much, however this is a product I feel is safe to use because it soaks into the ground so it is safer to use with kids and pets around.

I always emphasize the importance of wearing personal protective gear when using any pesticide or insecticide. Always wear gloves and eye protection and read the instructions carefully. These are also not products that are good to breath, so it is advisable to wear some kind of a mask or respirator to protect from breathing any mist or fumes into your lungs.

Now I'd like to go back to the product that I use the most of to inject into borer holes. The product is considered a natural product and is something I put together and have used with great success for many years.

It consists of orange Palmolive dish soap with natural orange oil added to it. I use the highly concentrated natural orange oil so that it is effective in killing the borer. Natural orange oil in larger quantities is something that is not readily available. It may take some searching to find it. It needs to be able to mix with water – water-soluble. Now I order mine from out of state, but janitorial supply houses may carry it as well. It is a natural orange oil detergent.

What I do is mix this in a two gallon pump sprayer using four tablespoons of detergent (and I use the Palmolive brand because it already has natural orange oil extracts in it, but other brands will work also) and I add four to six table-spoons of the **natural orange oil depending on how strong I think I need to make it. And that's it. It's all mixed with two gallons of water and then I inject that mixture into the borer holes. This has worked very well without using insecticides. And again remember to seal the holes with roofing cement after it has had a little time to dry.

Recipe for Natural Orange Pest Control

2- gallons of water
4- tablespoons of Palmolive Orange dish soap
4 to 6- tablespoons of natural orange oil (water soluble)

Note: On rare occasions sprays may be harmful to certain plants. If you feel the plant you want to spray may be adversely affected, spray a small area first.

****Please be aware of the difference between water soluble orange oil and pure orange oil extract. If you use pure orange extract it is much more concentrated than the water soluble type available at professional cleaning supply houses. If you were to use pure orange oil extract you would only use about 10 (ten) drops per gallon of water. You run a risk of burning the plant if you use pure orange extract. The natural water soluble orange oil by itself is classified as a detergent.**

Trees that borers are known to attack:

- **Ash**
- **Aspen**
- **Birch**
- **Oak**
- **Lilac**
- **Pine**
- **Poplar**
- **Willow**
- **Maple**
- **Black Locust**
- **Peach**
- **Cherry**
- **Apple**

Just to name a few.

The Codling Moth

Found throughout North America the Codling Moth eggs are flattened and white in color. The larvae are pink or creamy white and the caterpillars are about 7/8" long with brown heads. The adult moth is a gray-brown color. The forewings have fine white lines and brown tips and the hind wings are brown with pale fringes. They have a wingspan of about ¾".


adult moth


larva

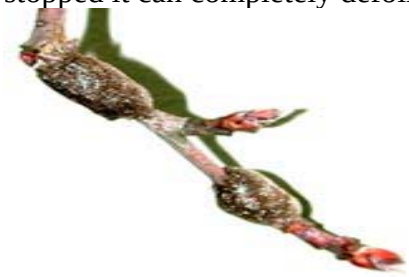
The over wintering larvae pupate first thing in the spring. The adults start to emerge when the apple trees begin blooming and the females start to lay their eggs on the fruit, leaves and twigs. After that the larvae burrow into the fruit core, usually from the blossom end. This process takes about three to five weeks and then they leave the fruit to pupate under the tree bark or in the ground. The larvae arrack most fruit trees including apple, apricot, cherry, peach, pear and plum.

In the early spring of the year you should scrap away any loose bark to expose over-wintering cocoons. After that you can spray the dormant oil to smother any eggs. In addition to these measures you could plant cover crops to attract native parasites and predators. A couple of good predators for these moths are Cially Ground Beetles that eat the pupae and parasitic Trichogramma Wasps that lay their eggs in caterpillars. You can also spray with a NC nematode solution in the later part of the winter.

In the early summer you can take an approximately eight inch strip of burlap and wrap it around the trunk of the tree up to a height of about three feet. To this burlap add a thick layer of Tanglefoot pest barrier which is a sticky substance that traps any insects that are climbing up the tree to mate, lay eggs or eat the buds or leaves. The natural orange spray I discussed earlier can also be an effective control for these moths in the various stages of their life cycle.

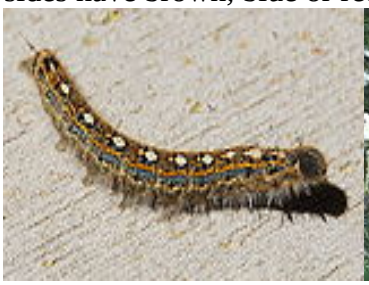
Tent Caterpillars

The eggs of this insect are laid in masses, which are generally covered by a hard foamy layer. Eggs are dark and shiny and encircle themselves around small twigs and branches. The larvae feed on the leaves of deciduous trees and shrubs, and if this insect is not stopped it can completely defoliate a tree in no time at all.



tent caterpillar eggs

The larvae is quite black and hairy and are about 2" long and the caterpillar is longer still at about 2 ½". They have a white stripe or rows of white dots along their backs and their sides have brown, blue or red marks.



caterpillar

tent

Adult

Look out because these babies can really spin some silk webbing, which they spin in the branches or crotches of trees. The adults are a kind of yellow tan to brown moth with two diagonal stripes across their wings about one inch long. Their wing span is about 1 ½". The first thing you can do is spray with the dish soap and natural orange oil mixture. Another mechanical measure is to take a long stick and drive some nails vertically through one end, then take this stick and put it into the nest and roll it around. The fibers in the nest are sticky and will adhere to the stick. Just bring them down and dunk them in a bucket of soapy water. This must be done at mid-day or right after a storm when they are in the nest. In the winter look for egg masses and just remove them from the tree and place them in soapy water. You can also try to attract parasitic flies and wasps by planting herbs such as catnip or wild flowers such as Queen Anne's Lace or spray with **Btk weekly while the larva are small. The caterpillars ingest this while they feed and they die. Btk will control a wide variety of insects. Read the label for a list of the insects controlled by this biological agent. Always wear protective gear like rubber gloves, eye goggles and a respirator or mask.

***Bacillus thuringiensis* (Bt) exists as bacteria in soil in the natural environment. There are many strains of Bt, several of which are used as biological pest control agents on edible crops, including organically grown foods. The toxicity of the different Bt strains is insect specific. For example, *Bacillus thuringiensis kurstaki* (Btk) targets moth larvae whereas *Bacillus thuringiensis israelensis* targets fly larvae. The larval stage of life is most susceptible to Bt toxicity due to the active feeding behavior of larvae. When gypsy moth larvae eat vegetation treated with Btk, a toxin is released in their stomach. This toxin eventually starves or poisons the insect. (Oregon.gov – Pesticide Exposure Saftey & Tracking (PEST) Program).

Elm Bark Beetles

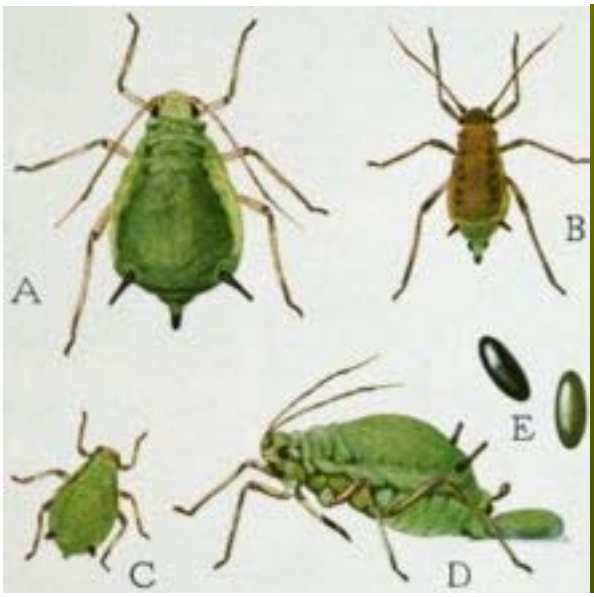
There are hundreds of different species of Bark Beetles from many countries, but they all look very similar. They are dark colored, hard-shelled, shiny and about the size of a grain of rice. The larvae are white grubs about ¼" long. Bark beetles attack trees that are diseased, under stress or are dead, but will sometimes attack healthy trees too. They fly in due to a scent that diseased, drought stricken, stressed trees produce and mate. Females form galleries in the inner bark and lay eggs inside or at the end of cut branches. The larvae that hatch feed on the inner bark and surface of the sap wood and create radiating tunnels out from the original egg gallery. When the larvae are fully grown, they make a cell in which to pupate to an adult beetle.

Elm Bark Beetles are carriers of a fungus that causes Dutch Elm disease so if you notice little holes in the bark of your trees with sawdust oozing out or little pieces of wood that look like toothpicks it is most likely bark beetles. And if you have trees where whole branches are yellow and drooping and leaves are wilting, in combination with the holes in the bark, chances are the tree is suffering from Dutch Elm Disease. The prognosis at that point is not very good and in all likelihood the tree will die.

The best way to prevent elm beetle infestations is to make trees less attractive to the beetle by promoting healthy growth with proper watering, pruning and fertilizing; especially during drought. After pruning make sure you burn the limbs or haul them away to the dump. Do not put the wood from pruning in your compost or save it for firewood. It should be hauled off or burned immediately. Fertilize your trees and give them a large drink of water and this will produce sap, which when secreted will flow out of the beetles holes, taking the grubs with it. Once they are out, spray with the natural orange oil spray. Our natural orange soap and oil spray works really well. It cuts right through the waxy shell of the beetle and kills it.

Aphids

The adult insect is about 1/32” to 1/8” long with two short tubes turning backwards from the abdomen. It has long green, pink, black or dusty gray antennae and may have a white fluffy coating. They may or may not have wings. Colonies develop quickly and wings seem to appear more when they are crowded. Nymphs and adults suck plant sap from most shade, ornamental and fruit trees. Aphids secrete a sticky honeydew that supports the growth of smooth mold and can spread viral diseases. This insect is most common throughout North America.



Aphid life stages


Aphids feeding on fennel

Aphids have natural predators such as Lady Bugs, Lacewings, Daddy Long-Legs and parasitic wasps. One that works extremely well is called the “Aphid Lion” also known as the Dobson Fly or Green Lacewing. These predators can be purchased in most garden stores, nurseries or mail order.

Two other predators that control aphids are caterpillars and Tiger/Soldier Beetles, but these are only found in the Western United States.

Spraying with our natural orange oil spray also controls aphids very well. Mix according to the recipe given earlier and to that add one tablespoon of horticultural oil as a sticker. Orange oil contains linalool and d-limonene, which are the active ingredients. Linalool acts as an insect nerve poison that kills on contact. You can also use lemon or lime oil.

There are several ways you can trap aphids. You can use some heavy paper and coat it with Tanglefoot or petroleum jelly and hang it up in your garden or greenhouse.

Scales

Pine needle scale is found throughout North America and has numerous conifer hosts. This insect most commonly attacks White and Colorado blue spruce, but other spruces, pines and Douglas fur are also susceptible to infestation. This insect seems to attack trees more often when they are young and has not been a severe threat to National Forests, but is prevalent in urban settings.

First indication of infestation is waxy, oval, white specks or scales about three millimeters long, on the needles. As these become abundant the needles of infested trees can look white from a distance. In mid June newly hatched juveniles or nymphs emerge from the protective scales and migrate to other needles to feed. This feeding causes yellowish green spots to develop around each insect. During a severe infestation these spots will merge and needles will dry out and drop off prematurely and all of the rest of the needles, except for new needles, take on a grayish unhealthy appearance. Needles on infested pine trees are usually reduced to half their normal size.

Continuing scale infestation reduces the growth and vigor of trees. If this insect is left untreated over time they can do a tremendous amount of damage. Even, eventually, possibly killing the tree. So a tree with scale should be treated as soon as the infestation is detected.

Scale on a pine needle

Red Scale, brown scale, oyster shell scale and black scale are some different types commonly seen. They are difficult to combat or control with pesticides because this insect has a hard waxy shell that protects it. The control that has worked best for me is dormant oil. You can spray dormant oil in the spring or most any time as long as the temperature is not above eighty degrees Fahrenheit. Be sure you completely cover all of the insect as well as the eggs and nymphs. Dormant oil sprays are fine for ornamental and fruit trees as well.

You can also release parasitic wasps. This works well against California Red and Oleander Scale.

Conifer Sawfly

Sawflies are inconspicuous wasp-like insects that do not sting. When the sawfly is in the larval or juvenile stage they look like hairless caterpillars that love to eat plants. The most distinguishing characteristic between sawflies and caterpillars is the number of prolegs, which are the ones closest to the head. Caterpillars normally have only four sets of prolegs, while sawflies will have five or more sets.

Sawfly adult and larva

Sawflies in your pine and spruce trees can be very damaging. The larva can destroy the needles. They generally start in the upper branches. If there are repeated infestations over a long period of time it will eventually kill the tree. Cracks in upper or lower branches are where the eggs over-winter and when they hatch out they will devour every needle they can find. To control you spray the eggs using liquid soap, orange oil and dormant oil, in the winter or spring when they are in their cocoons. This spray will smother and kill the eggs.

To control sawflies, spray with superior oil on your trees, but not on Blue Spruce. The best control is to get and keep your trees healthy and strong.

Some pests and diseases can be prevented by site selection alone. It is not good to force plants to live in conditions that are not suitable to their needs. Before planting a plant learn as much about the plants needs as possible and you will avoid many disease and insect problems.

Hackberry Psyllids

Psyllids are a small aphid-like insect that causes a gall commonly seen on the underside of the leaves on hackberry trees. They are most commonly noticed in late summer and may even be seen in September and October. They may even be active in mid-winter on warm sunny days. Alternative names for this insect are the Hackberry Gall Maker or Jumping Plant Lice. They have powerful hind legs that allow them to jump and fly away quickly. They are about 3/16” long and have lightly colored wings with tiny dark spots on them. This particular specie is generally specific to Hackberry trees and is not found elsewhere. Adults fly to Hackberry trees in the early spring and lay their eggs on the leaf buds. The eggs hatch into tiny nymphs that stimulate and cause the galls to rise and swell in which the insect lives and feeds for the rest of the summer. When galls complete their

development in late summer, the adult leaves the gall to pass the winter in the crevices of bark or in other sheltered locations. Like other pests, in the winter they may be attracted to the inside of your house, and although they are quite a nuisance in the home they are not dangerous to humans, pets or houseplants, although some people report being pinched when they land on exposed skin. They do not sting and they don't carry diseases and so chemical controls may not be warranted.

Hackberry Psyllid galls

Adult Psyllid on pencil (Photos courtesy of UNL Extension)

Effective control outside on adults in late summer is very difficult to achieve. Common products like ant and roach sprays and powders are very ineffective against this insect.

Control by spraying trees with insecticidal soap or pyrethrin if the infestation is serious. You should begin spraying at the first sign of damage. You can also use horticultural oil even during the growing season to control a wide variety if insects like psyllids, mealy bugs, white flies and leaf hoppers to name a few. Never spray oils when trees are under stress and it is a good idea to do a deep soak watering a few days before you spray.

Mealy Bugs

Mealy bug

Producing several generations per year, mealy bugs are a soft bodied insect that are a close relative of scales. Females lay eggs in a white mass and the nymphs hatch out in about ten days. The little crawlers wander away to find feeding sites, where they develop

for one to two months longer. They may damage any part of the tree by sucking out the sap, which may cause leaf distortion. If left untreated they can cause the death of the tree.

The female adults are a pinkish color and are covered with a white, waxy fluff. Their bodies are soft, oval, about 1/10” long and distinctly segmented. The males are tiny, two-winged insects. The nymphs similar to adults but are rarely seen because they are so small. Most species are found in the southern part of the United States, but the long tailed mealy bug is found throughout North America and all species are found in greenhouses.

Adult mealy bugs and nymphs suck out plant juices from many types of crops such as potatoes, avocados, ornamentals and tropical plants. They feed an all parts of the plant, but like new growth the best. Their feeding causes leaves to wither and turn yellow and fruit to drop off prematurely. They also excrete a sticky, gooey substance of leaves that can cause sooty mold fungus.

Mealy bugs are effectively treated with orange oil and soap spray.

Leaf Scorch Control and Prevention

Drought and reflected heat are two of the main causes for the browning and yellowing of leaves, especially along the tips and margins. It can also be caused by bacteria. This would also include rolling of the leaves, wilting and stunted growth. During times of drought it is better to avoid frequent light watering and do deeper soaking that will get water deeper into the ground. Also if possible plant trees as far away from buildings with large windows facing the sun, as well as concrete and asphalt, which radiate intense heat on hot summer days.

Leaf Scorch

Needle Cast on Conifers

Needle Cast is considered a fungal problem and can be difficult to control. The symptoms of this disease first appear on developing needles as yellow spots and changes to red or orange brown as damage becomes more severe. Affected needles will generally fall off by mid-summer. This disease seems to only afflict conifers.

Needle Cast

Give your trees good air circulation and prune out infected limbs. Clean up all of the infected needles from the ground around the tree, even from the previous year.

When new shoots are half grown spray with Bordeaux mix and repeat every fifteen days. Bordeaux mix is a combination of hydrated lime and copper sulfate. It is mixed into a wetable powder that can be dusted onto your plants or mixed with water and sprayed. Generally found in the powdered form it is an organic fungicide with insect repellant properties. It will help control common diseases such as bacterial leaf spots, black spots and wilts, fire blight, light powdery mildew, peach leaf curl and rust.

Yellowing of Trees and Shrubs Caused by High Ph


Yellowing of leaves due to high Ph

The mix I'm going to talk about has proven in many ways to be a bad idea. It is intended to cure yellowing of shrubs and trees. The mix is lime and some form of chelated iron. The most common reason your plants and trees turn yellow is because their soil is too alkaline, which means the Ph is too high. When the Ph is too high iron and other nutrients become unavailable to the plant, so it suffers. Since lime increases the Ph of soil, lime is actually the problem and should not be mixed with the iron. The iron chelate by itself will help yellowing shrubs and trees, if high Ph is the problem.

Fire Blight

This problem is bacterial. It can be brought on by over fertilization – especially in ornamental pear trees. Symptoms include leaves shriveling and turning brown or black while remaining attached to the twigs. The symptoms progress from the tips of the shoots towards the roots. Shoot tips turn black, wilt and curl downward and any fruit will turn black. A key indicator is that the black leaves and or fruit remain attached to the tree.


Fire Blight

Once a tree is infected with fire blight it is difficult to treat, so avoid it by choosing and planting resistant cultivars. Also, don't prune fire blight susceptible woody plants or trees too severely, and don't over feed. You can prune out infected branches along with 7 to 10 inches of healthy tissue, but be sure to disinfect your pruners between cuts. You can also treat fire blight with Bordeaux mix, a combination of hydrated lime and copper sulfate, which is mixed with water and sprayed.

Foliar Spraying

Now I'd like to discuss foliar spraying as a means to treat for borers, scale, mites and other conditions.

Unfortunately there is only a short window of opportunity to effectively control for borers or many other insects for that matter. The reason for this is you have to do your spraying at the exact time that the adult insect is in flight. The adult borer for example looks for a suitable host tree. This would be a tree that is weak, that has lots of dead wood in it, that has lots of structural openings. It looks for a tree that appears to be sick. These are the types of trees that these borers primarily want to attack. And when you are considering foliar spraying, it has to be timed to when the adult borer is looking for a new host.

I have found that one good way to time spraying so that I kill the adult borer is by the blooming of forsythia bushes. This process may not work everywhere in the country, but I've noticed that when the forsythia bushes come into bloom that is when the adult borer is in flight. By timing your spraying to this time you can kill the adult and if it has already laid its eggs, the spraying will also smother them and prevent them from hatching.

I try to avoid using pesticides whenever possible and the natural orange pest control formula works well for these adult borers. I do beef up the concentration a bit for the borers, more than that I would for say spraying aphids. For borers I would use say 5 Tsp. of soap and 6 Tsp. of orange oil and 2 Tsp. of dormant oil. I use the dormant oil because it causes the spray to stick better and smother any eggs that have been laid. The natural orange oil also breaks down the eggs and dissolves them. It's a little difficult to kill the adults because they are beetles and they have a hard shell. That's where the dormant oil comes in, because it holds the orange oil in place longer and it's the natural orange oil that actually kills the adult. Now you should be aware that most natural pest controls have a very short residual effect. They are contact killers only and their effect dissipates over a short period of time. The good news is they are not harmful to the environment and can be re-applied as frequently as needed.

Now like I said before you only have a short window of opportunity in which spraying will be effective. Depending on what type of borer it is, it may be only a couple of weeks to a month that you can do the foliar spraying.

Now there are other borers, for example the Zimmerman Pine Moth, that hatch in late summer but do not tunnel into the tree until the following spring. For this insect treatments can be effectively applied in late summer and on up through mid spring. Sometimes this insect will hatch out and may wait an entire year before it begins to tunnel into the tree. So it is easy to kill it and smother any eggs that are on the trunk of the tree during that time. But for most insects, and perhaps all, the best time to spray is in the spring of the year, and generally like I say around the time the forsythia bushes are blooming is when the adult insect is active. So paying attention to your trees and

checking them to see what you have going on, that ounce of prevention is worth a pound of cure.

Now I'd like to give you some kind of an idea how to do this spraying in you own yard. There are a number of types of hose end sprayers that you can use to put these different chemicals in. And they mix whatever chemical you are using at a rate of so many tablespoons per gallon of water. Most of them work pretty well, but there are some that really don't work all that well. The one that I recommend is made by Ferti-lome and built really well out of metal, and the ones that I have used that don't really work well are made out of plastic. It has a really good gauge on it and I feel the mixture is more accurate than any of the other ones that I have used. It has about a 16oz. plastic bottle that you can mix the soap, orange oil and dormant in with water until you get about the consistency of straight dormant oil. You set the dial and it will dispense at the tablespoons per gallon rate that you want it to. You can even put straight dormant oil in this and it will mix at the desired rate up to ten tablespoons per gallon. It even has an attachment that you can put on it that will allow you to dispense at teaspoons per gallon. It's a good sprayer and has worked great for me.

One other point I'd like to make about spraying, and that is, whenever you spray for a particular pest, you are in all likelihood killing some beneficial insects as well, especially if you use a commercial insecticide. I believe we would be better off not killing our beneficial insects. Most of the time they control the detrimental insects that attack our trees and shrubs. When we spray insecticides we kill those beneficial insects and create a vicious cycle. I would advise not applying insecticides unless you absolutely have to, and if you do have to I would strongly consider using soaps and oils instead of commercial pesticides. The soap and oil sprays tend to be less harmful to the beneficial insects. But it should still be remembered that some of the natural pest controls are still highly toxic, especially during the first few hours after they are applied. They can kill large numbers of honeybees, spiders and other beneficial organisms, but with that said, they are still better than the commercial pesticides for the environment.

Botanical Pesticides

Long before synthetic pesticides came along the earliest insecticides were derived from plants from all around the world and most particularly from tropical forest regions. These special plants are now grown commercially and the roots, stems, flowers, seeds, or any other plant part, can be ground up, purified and packaged for sale. The following is a list of some of the botanical pesticides.

- Nicotine
- False Hellebore
- Pyrethrin
- Citrus Oil
- Neem
- Quassia
- Tomato Leaf
- Sabadilla

Remember to always read and follow the label directions when applying any insecticide. They are toxic to humans and animals when first applied. Always wear protective gear such as rubber gloves, goggles and masks or respirators.

Oil and Soap Sprays

These sprays work well as a sticker, meaning they stick to the plant as well as the insect. Most oil and soap sprays should be reapplied after ten days and after it rains. Volck or dormant oils act as a contact poison on insects, but it must cover the insect completely to work well. When preparing your oil sprays keep them out of direct sunlight as this will break down the mixture and reduce effectiveness. It is also advisable to test your spray on a small portion of the plant first to make sure that it won't have an adverse effect on the plant as a whole.

Trapping

What I'm referring to when I say trapping is pheromone traps. You can buy or make these, but what they do is disrupt the mating cycle of the adult insect. Females put off a sex pheromone to attract the male and the male's sole purpose in life is to find a receptive female (I guess insects and humans aren't that different) and what these traps do is flood the air with pheromone so it becomes very difficult for the male insect to find a mate. You can hang these up in the tree or place them in your yard in the vicinity of the trees you are trying to protect from the adult borers. And you can get pheromone traps for other insects too. Pheromone traps can be purchased at high-end nurseries or chemical supply houses.

There are many organic gardening products that are not always available at your local garden center. But fortunately there are many good mail order supply companies that offer a wide range of merchandise, which includes botanical pesticides and botanical controls, copper and sulfur fungicides, pheromone traps and predators.

Here is a list of companies that may supply some of these products.

Hydro Gardens Inc.
P.O. Box 25845
Colorado Springs, Colorado
80936

Nature's Control
Phone: 541-245-6033
P.O. Box 35
Medford, Oregon
97501

Organic Insect Control
Orcon Organic, Inc.
5132 Venice Blvd.
Los Angeles, California
90019

Fertilization

A number of years ago a Gallup gardening survey indicated that almost half the gardeners in the US use little or no fertilizer on their trees or gardens. What is unfortunate about this statistic is that gardeners aren't getting as many gorgeous flowers or as much produce as they should, and I'll bet they are also struggling with insect and disease problems as well. Many of these types of problems can be avoided with a good fertilization program. Trees and plants are healthier, more beautiful and more productive when they receive good nutrition.

Fertilizing is not always a simple matter. What may benefit one tree may not benefit another. And what works in one area may not work in another. For instance in some soils you may need to mix aluminum sulfate with iron sulfate in order to make the iron available to the tree. Chelating compounds must be added to some soils or they may need to changed from acid to alkaline, or visa versa. Although most shade trees seem to prefer a slightly acidic soil. Ground up limestone will increase alkalinity while aluminum sulfate and sulfur will increase a soil's acidity.

Nowadays there is no need to mix your own fertilizer. Individual states have passed laws that require fertilizer companies to disclose the nutritional value of their products and to indicate those numbers on the label. Fertilizers usually contain three primary elements. The elements are nitrogen, phosphorous, and potassium. Most common fertilizers have three numbers on the label that represent the percentage of these three elements contained in the mix - Nitrogen (N), Phosphorus (P) and Potassium (K). For instance a fertilizer with a number of 16-16-8 contains 16% N, 16% P and 8% K. There are many types of fertilizer analysis (meaning mixes). Some fertilizers are high in nitrogen and some are high in phosphorus or potassium. These different mixes are formulated for specific needs. It is important then to understand what the needs are of the plants and trees you are fertilizing. Some plants and trees need nitrogen reapplied every year and in some cases month by month whereas phosphorus and potassium tend to last much longer and do not need to be re-applied quite as often.

I'd like to go over some of the differences between two types of fertilizers – organic and liquid or water-soluble.

Organic fertilizers (like steer manure) have nutrients that are not water-soluble and are therefore released to the plants or trees slowly over time, perhaps over months or even years. For this reason organic fertilizers work best when applied in the fall so the nutrients will be available in the spring.

Organic fertilizers stimulate beneficial soil microorganisms and improve the structure of the soil. Microbes play an important role in converting organic fertilizers into soluble nutrients that can be absorbed by your trees and plants.

There are distinct benefits to each type of fertilizer's delivery system and availability of nutrients. Liquid, synthetic fertilizers do have some advantages over organic types.

Because they are water-soluble they make nutrients available to the plant even when the soil is cold and microbes are inactive. For this reason some organic, all-purpose fertilizers contain small amounts of synthetic fertilizer, to ensure the availability of nutrients to the plant. Water-soluble fertilizers are dissolvable in water and can therefore be added to or leached out of the soil easily with water. This makes it easy to control the amount of nutrients available to your trees and plants.

Soluble fertilizers will usually have their N-P-K (nitrogen-phosphorus-potassium) numbers on the package label. These are the elements most necessary for plant life.

Nitrogen is the most important of the nutrients because it is the one that controls the processes that make proteins vital to new protoplasm in the cells. Nitrogen is essential to production of chlorophyll and for leaf growth and it is responsible for overall size and vigor of trees and plants.

Phosphorus is vital for the process of photosynthesis and provides a mechanism for energy within the tree or plant. Phosphorus is also necessary to the creation of a strong root system.

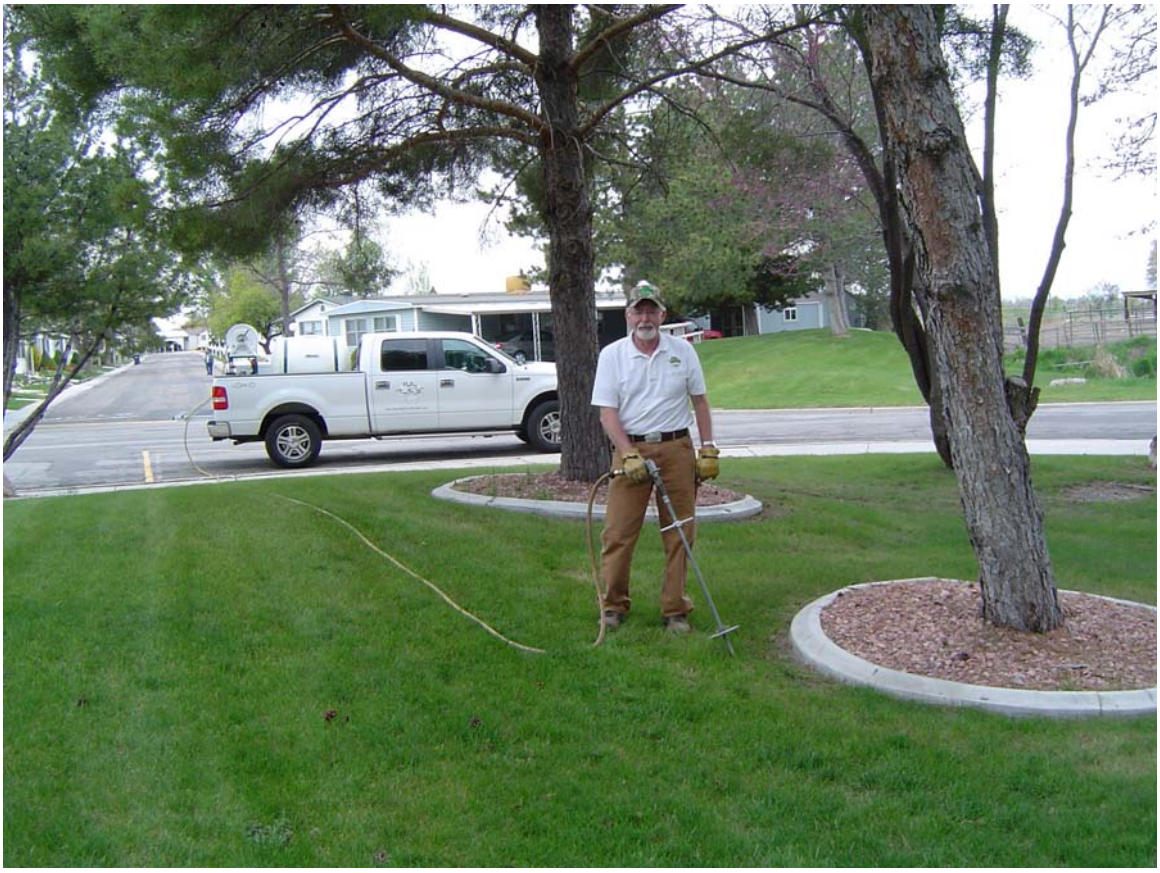
Potassium or potash is important in the manufacturing of sugars and starches. It also increases chlorophyll levels in the leaves and helps control stomata openings so plants area able to make greater use of light and air. Potassium is also important in all stages of plant growth.

Micro-nutrients-
It is well known by science that plants need trace elements as well as N-P-K. The theory being that together they will be able to provide the plant with all the necessary elements to alleviate any nutrient deficiencies. The fertilizers you buy should contain these thirteen elements that are essential for plant growth; boron, calcium, copper, carbon, chlorine, iron, hydrogen, magnesium, manganese, molybdenum, sulfur, zinc and oxygen. Without these elements plants cannot grow and will eventually die.

Foliar Feeding-
Studies have shown that plants can absorb nutrients 9 to 20 times more efficiently through their leaf surfaces than through their root systems. With that in mind spraying foliage with liquid nutrients can produce remarkable yields. For the best results spray your plants at their critical growth stages such as transplanting, blooming or just after fruit sets.

Remember even if the right amount of nutrients are present in the soil some nutrients cannot be absorbed by plants if the soil Ph is too high or low. For most plants soil Ph should be between 6.0 and 7.0. A simple soil test will measure the Ph of your soil. You can send soil samples to a lab or sometimes you can purchase a low cost soil test kit from your local extension service and do it yourself. Keep in mind that is best to raise or lower soil Ph slowly over the course of a year or two.

In the past thirty years I have used a lot of different types of fertilization on trees and shrubs, and over this time I have found only two or three formulations that work best for me. I'm sure this is mainly due to the type of application I use, which is a deep-root fertilization by injection method, meaning that I put the fertilizer into the ground under pressure. I also use a polymer in my application, and these polymers expand and hold water under the ground.



The fertilizer formulation that has worked best for me is a 15-30-15 (NPK) water-soluble type with micronutrients. This is one of the best all around fertilizers I have used. This formulation of 15% nitrogen, 30% phosphorus and 15% potassium is the best formulation I have found for trees and shrubs. I have also had good success with another product called Miracid by Scotts Miracle-Gro and it works extremely well on acid loving plants. On those acid loving plants it does a good job of helping create a strong root system and it helps release nutrients that get locked up in alkaline soil.

There are a number of companies out there that manufacture these products. One being Peter's company that manufactures a water-soluble fertilizer. Also Scott's Miracle-Gro and one called Grow-More, which I use quite often, has a good water-soluble fertilizer. I have used two criteria to determine which fertilizers are the best. The first criteria is whether they mix well in water and dissolve completely. This is important to me because if it leaves a lot of residue it clogs my pump. The second criteria is how well it works.

The three products I have mentioned here all mix well in water and produce healthy trees and shrubs, which ultimately is what my clients are really looking for.

I would like to remind you once again to always use caution when using fertilizers or any other chemical, to always follow the label directions and use protective gear like goggles and rubber gloves. Always protect yourself and others.

It is my hope that the information in this book has given you a large degree of insight into how to take better care of your valuable trees and plants without destroying the natural environment in the process

Also, the products and techniques described in this book are ones I have personally used for many years. It is my belief that they will work as well for you as they have for me.