Pruning and trimming your trees

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Pruning a tree can be an important tool for keeping it healthy as trees do not always grow into a form that is best for them or the surrounding circumstances. For all non-flowering trees pruning is best done in late winter before the buds start to swell and the tree breaks dormancy. The second best time is mid-summer which allows for better shaping and dead limb removal as the leaves are on. For flowering trees it is best to wait after they flower to prune as pruning in late winter may remove all of the flowering buds. It is important to remember that the leaves are the energy production center of the tree and that each tree has a fairly good balance between root system and leaf area. Leaves feed the roots and roots provide water and nutrients that the leaves need to survive and function. Although a healthy deciduous tree can survive complete defoliation twice, removing too much at one time can be stressful and lead to root dieback and other symptoms of energy depletion. For this reason it is suggested that removing 1/3 of the leaf area at any given time is fine but more than that can put a tree into energy stress. There are many example of storm damage and bad pruning where more than 75% of the tree's top was removed and the tree survived and grew back. However, there are also examples where trees weakened by this type of loss also became very susceptible to insect pests that eventually killed the tree. Doing a good job pruning should help a tree and not weaken it. Figure 1 shows the basic physiology of a tree.

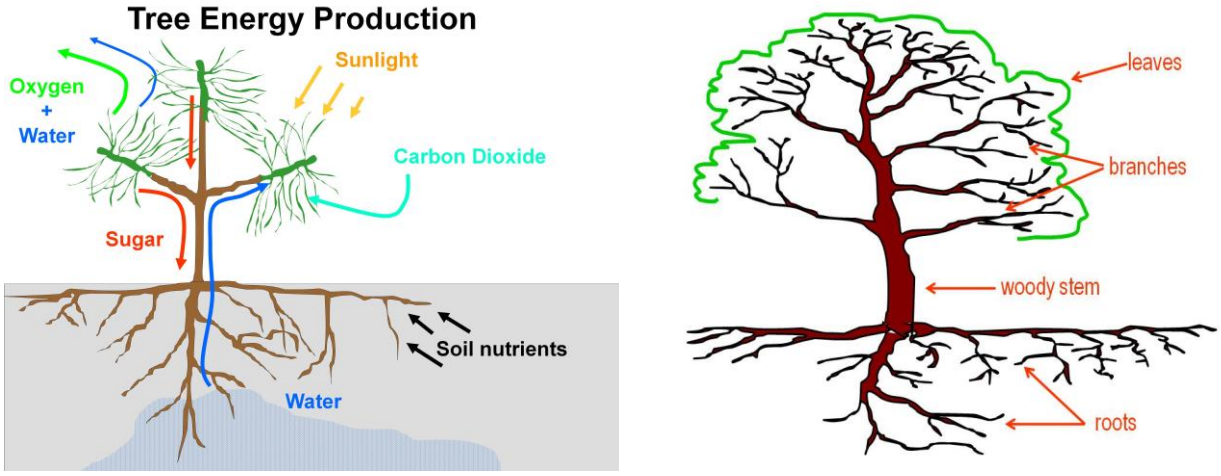

Figure 1. *Trees try to maintain a balance between leaf area for energy production and root area for water acquisition. Without enough sugar production root tips die back and without enough water branch tops die back.*

Pruning off branches for tree health can be somewhat different than pruning off branches for tree shape. Broadleaf deciduous trees have two kinds of leaves – sun leaves and shade leaves. The sun leaves are on the outside of the tree and produce the most sugar for the tree. They are thicker and often more water-loss resistant than shade leaves, that occur in the inside of a tree. Shade leaves often cost the tree energy as they receive so little sunlight that they can be inefficient. At the same time they also lose water. Pruning for tree health and vigor means that branches and leaves that occur on the inner portion of the tree are removed. This give a tree more of a cathedral look that most people find very pleasing and also decreases unnecessary

water loss for the tree. Figure 2 shows the basic concept of pruning for tree vigor and health.

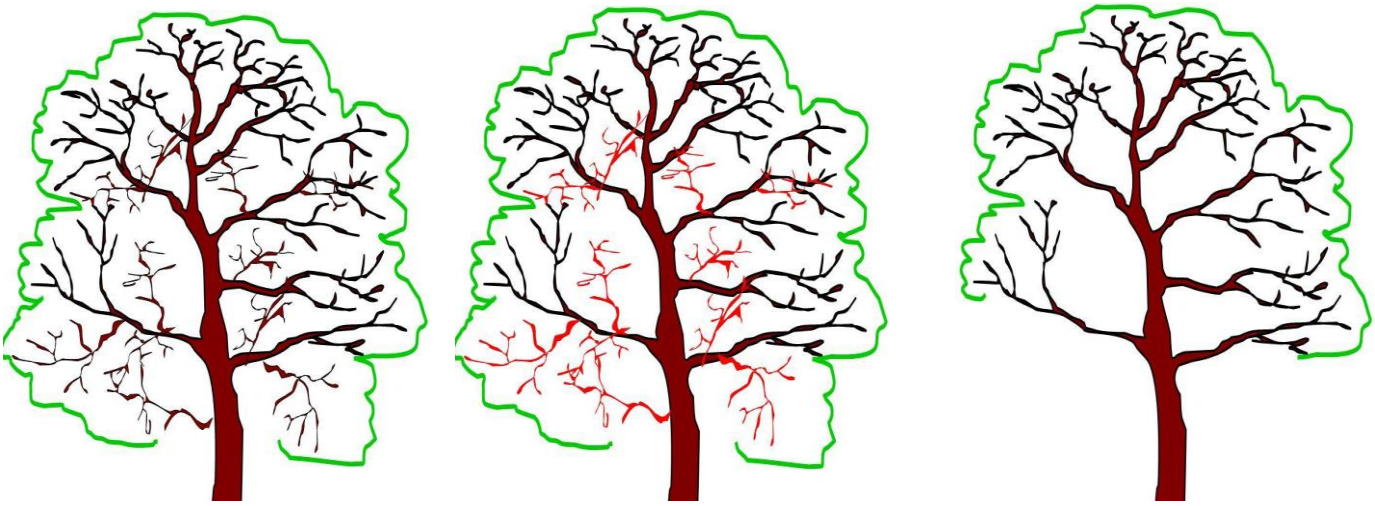

Figure 2. *An example of branches and leaves that can be removed with no negative impacts to a tree but that will increase the overall health of the tree.*

Occasionally trees get bigger than one might expect and thus require shaping or special pruning. This may be because they have overgrown a garden, other trees, into powerlines or even into a house. The tendency for an inexperienced pruner is to cut branches or tops back in a straight line, or matching the branch removal to the obstacle. Although this may work temporarily, it can also cause injuries to a tree that promoted stem decay and a structurally unsound tree. It may also lead to premature death of the tree. Proper pruning usually allows for the same effect – removing the branches that have grown too long and creating wounds that are more likely to heal and prevent stem decay and structural unsoundness from occurring. Figure 3 shows an example of how the top of a tree may be brought down while preserving a trees structural integrity and beauty.

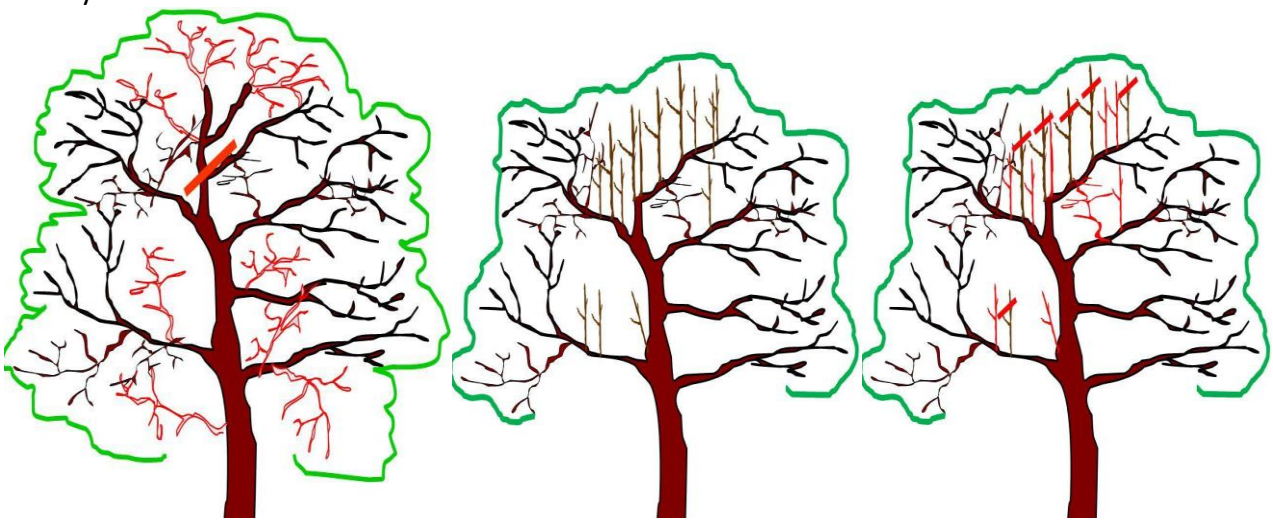

Figure 3. *An example of how a tree grown too tall is properly pruned back. Often such pruning will stimulate dormant buds and water-sprouts or "suckers" will develop. These need to be pruned back and selectively removed to help the tree regrow a shorter and healthy top.*

The concept of pruning back a branch or a top is the same. Figure 4a shows examples of different levels of pruning. In each case, a branch is always pruned back to the junction of another branch. Figure 4b shows an example of pruning for health. Again the same system of pruning applies to bringing a top down or pruning the horizontal sides of a tree. Branches and the stem wood that supplies the tree with water remains alive, and thus costs the tree energy to stay alive. When a tree grows two branches to the same location on a tree it is like a business having two employees that do the same thing and get into each other's way. For a tree there is the same amount of light hitting the same location, and if there are two branches trying to capture that same light they interfere with each other, reducing the efficiency and thus vigor of the tree. Removing such interfering branches is very helpful to the tree. But which one should be removed?

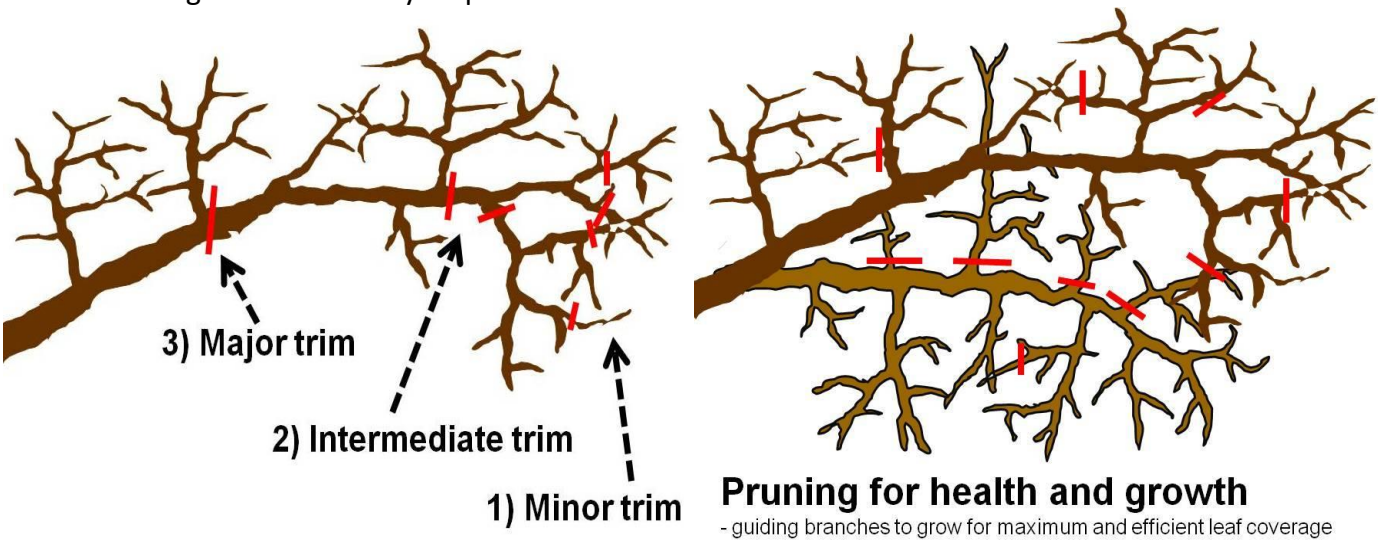

Figure 4a. *How to prune back a branch.* ***Figure 4b***. *Interfering branches and their removal*

Picking which branches to remove is an exercise in aesthetics as well as figuring out which one helps the tree more. In either case the tree will do well, though an important consideration is how the tree will grow and how you can guide it to grow into the shape you want. If you want the tree to grow taller favor upper branches. Remember those branches in that are in the sun are major energy producers. If you want the tree to stay smaller favor the lower branches. The good thing about deciduous trees is they will grow back leaves next year and branches that were in the shade and had shade leaves will now grow sun leaves if they have been opened to the light.

When actually deciding where to make your cut consider how the vascular system of a tree works (Figure 5). Water is pulled up to the leaves via what is called negative potential energy – which is also better known as "suction". In dry regions and during drought this suction may exceed 100 lbs/square inch – or far more than any vacuum cleaner can create. When a cut is made into the water conducting tissue of a tree in the summer an air pocket immediately forms in the water conducting tissue blocking further water flow. Depending on the size of the wound the air pocket may be very large or very small, and the longer the wound stays open the larger the potential air pocket that may form. Consider how you drink from a straw. If a hole is poked into that straw obtaining your drink by using the straw becomes very ineffective, and if there is a large hole the entire straw becomes non-functional. If this is your only way of obtaining fluids you will soon die of thirst. The sapwood of a tree is made up of hundreds of thousands of tiny straws, and although

most trees have a mechanism to block airflow into all of the straws when an injury occurs, the higher the drought stress or the larger the injury the more dysfunctional the sapwood becomes. For this reason a pruning wound should be kept as small a possible, and adjacent to tissue that will stay alive and thus allow for a new protective "skin" to grow over the wound.

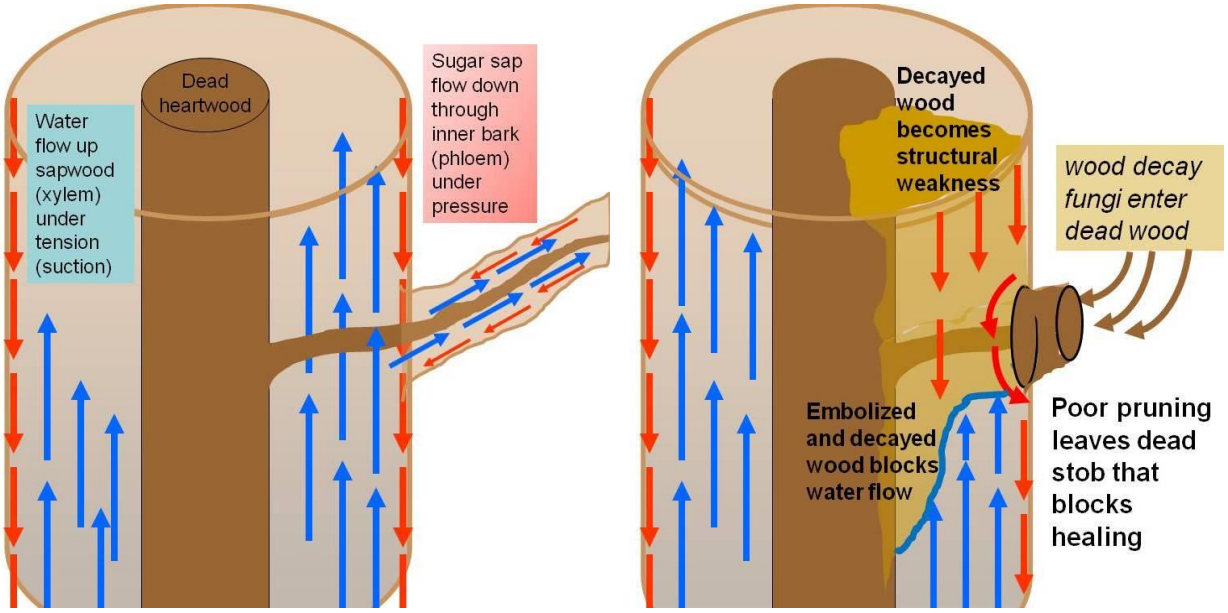

Figure 5. *How the vascular tissue of a tree functions. If the flow of water is disrupted the tree will have a harder time supplying leaves with enough water to function. The longer a wound remains open the higher the chances that decay fungi will invade and start rotting the wood.*

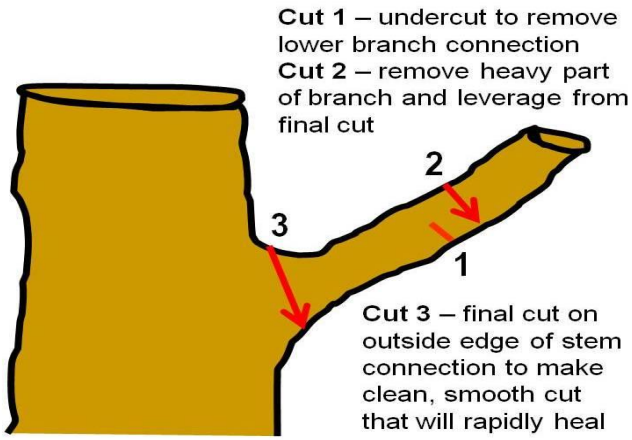

Figure 6. *Proper cuts for removing a branch*

Pruning off branches and leaving a portion of the branch or a "stob" that no longer has any green leaves or needles will result in that stob dying. This then becomes a dead entry site for insects, wood decay fungi and in some cases pathogens that will then invade healthy tissue and kill the branch or tree. Each cut should be made so that it is flush with a functional part of the tree (Figure 6). If a branch is small enough that you can support the weight with one hand while snipping or cutting with the other, only one cut needs to be made. On deciduous trees this cut should be made on the outside edge of the slight swelling that occurs where the branch enters the stem. This swelling is actually part of the main stem and will retain water and sugar flow. If the cut is made "flush" with the stem then the injury created is much larger than needed. For smaller branches this is not a big issue bur for larger branches a flush cut may create a wound that is twice as big as needed. On some species of trees pruning will stimulate a lot of water sprouts to form. These can grow into full sized branches if they have sufficient light and space to grow into. Water sprouts develop when dormant buds in the bark of a tree are suddenly exposed to light. This is an adaptation for

some species of trees to regrow a crown if damage removes the top of the tree. Ash trees, willows, cottonwoods and maples commonly have the ability to do this as well as most fruit trees that grow in Montana. In general, the heavier you prune the more suckering will occur. Some suckers can be cultivated to become missing branches and they may need pruning to guide them in the direction you want. Most suckers need to be removed as they will not develop well from the competition of other suckers and stress the tree. For some trees once sucker growth is stimulated it seems to occur every year thereafter.

Conifers or "evergreen" needle trees require slightly different pruning than deciduous trees. Most species that grow in Montana do not have shade and sun needles, and also do not have the ability to resprout branches. Some varieties of spruce trees will develop suckers when excessively pruned but these sprouts rarely develop into branches unless they are fully exposed to sunlight such as near a broken or dead tree top. Conifers will typically hold onto their needles for 3-7 years depending on the species. The older the needles get the less efficient they are and the less energy they produce for the tree. Dormant buds in the branches also become unable to sprout the further inside the tree and older they are. All of our cold tolerant evergreen are also quite shade intolerant and thus need full sunlight. Their ideal shape is that of a cone (Figure 7). The following rules for pruning conifers should be followed:

1. If branches are in the shade they will die off.
2. Pruning for shaping is best done early summer after new needle shoots have elongated.
3. If you prune a branch back past green needles the branch will die.
4. Branches that are removed should be cut as close or flush to the stem as possible because unlike deciduous trees they do not develop a "swelling" where the branch attaches to the stem.
5. As common conifers such as spruces and pines get taller in wind prone areas their tops become susceptible to breaking off and in the case of spruces that are very shallow rooted they are very prone to tipping over with their roots pulled out of the ground.
6. Topping can be done on spruces and pines with minimal bad impacts – as opposed to many broadleaf trees – especially softwood trees such as cottonwoods, willows and poplars. The top stem should be cut back within about 1-inch of a healthy whorl or branches.

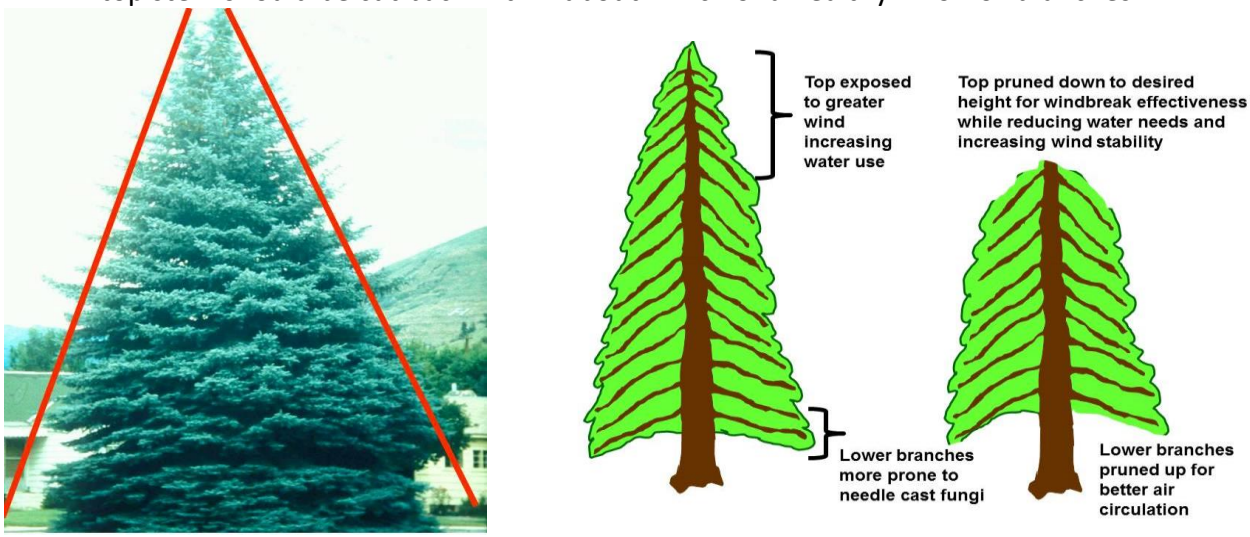

Figure 7. *The ideal shape for most conifers is cone shaped. Proper toping is an acceptable means of keeping these trees from getting too tall where they can be blown over or broken off by wind.*

Storm damage

Windstorms strong enough to tear limbs off trees can be a problem across Montana. Cottonwoods, poplars, willows, green ash and Chinese or Siberian elms are particularly susceptible to this problem because they have soft and brittle wood. With high enough wind speeds, however, no tree species are risk free. The tremendous leverage that wind exerts on tree limbs causes various types of damage from broken tops out of conifers such as spruces and pines to torn and twisted limbs on deciduous trees. This type of damage rarely heals well by itself, which makes immediate pruning essential if the tree is to be saved and allowed to regain its former beauty

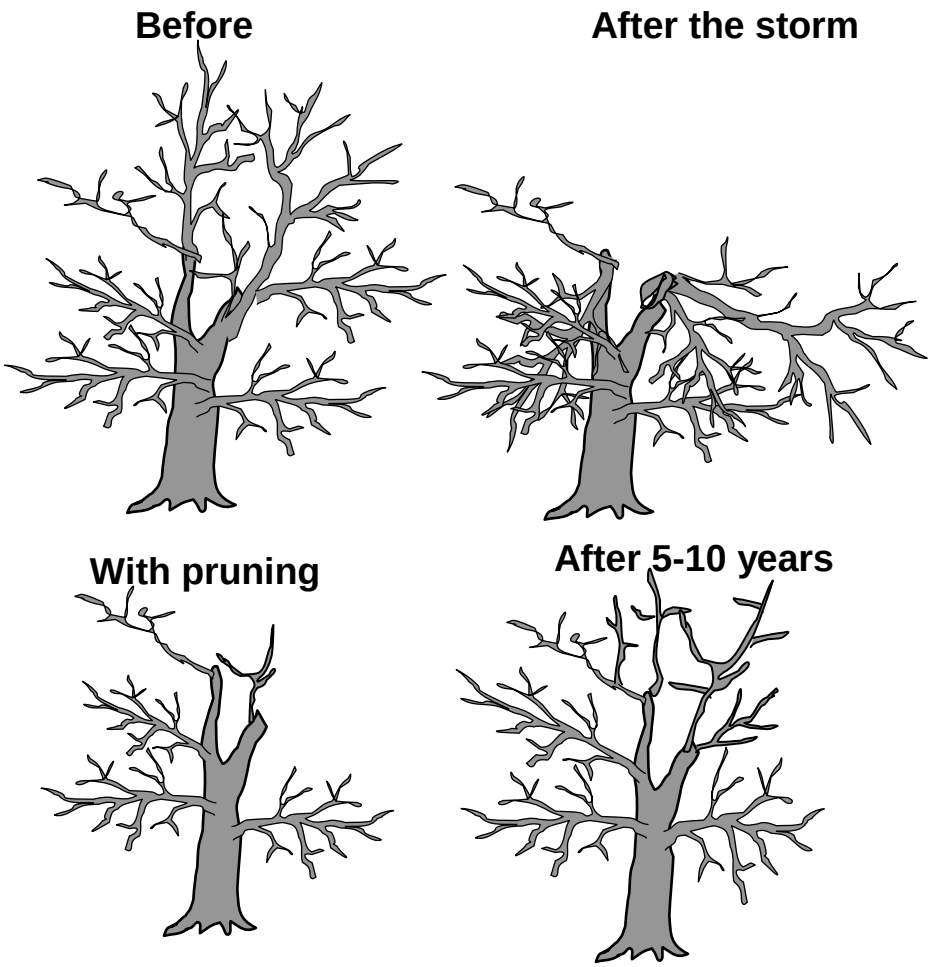

Figure 8. *Pruning off damaged limbs, creating healable cuts and managing suckers will allow a tree to recover over time. Continued proper pruning is required to help shape a tree.*

Type of damage

In each case it is important to properly treat the different types of mechanical damage a storm can cause to give the tree a chance to properly recover. The first goal of pruning injured branches is to minimize the amount of woody tissue exposed to the air. Open wood is an invitation to pests and pathogens to enter the tree and further damage it. Injuries cause by twisted and broken branches need to be trimmed in such a way that the tree is able to heal over the wound as quickly as possible. Typical types of injuries are diagramed in Figure 9.

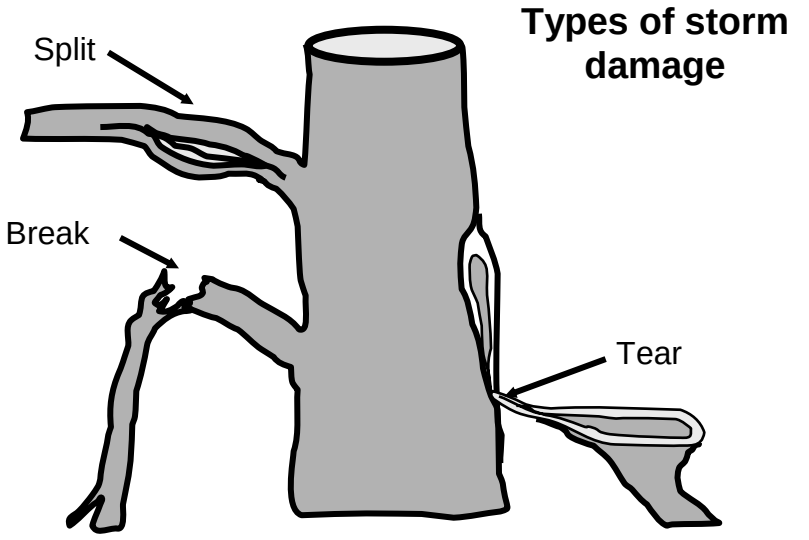

Figure 9.

The jagged injury created by a broken branch will heal very slowly since new bark has to grow over the injured area from the surrounding healthy bark. Any kind of irregular surface will act as a barrier to this new bark growth (called a callous). A smooth surface made by a proper saw cut will allow bark to cover the exposed wound much more quickly. It is equally important to prune branches back to an area of healthy tissue that will remain alive. If a break occurs near the main tree stem or close to a larger branch, the broken branch should first be removed to reduce the weight and leverage on the healthy wood. Next, the branch should be trimmed back close to the main stem at a slight outward angle as shown in Figure 10 to ensure that enough healthy tissue surrounds the cut to promote healing.

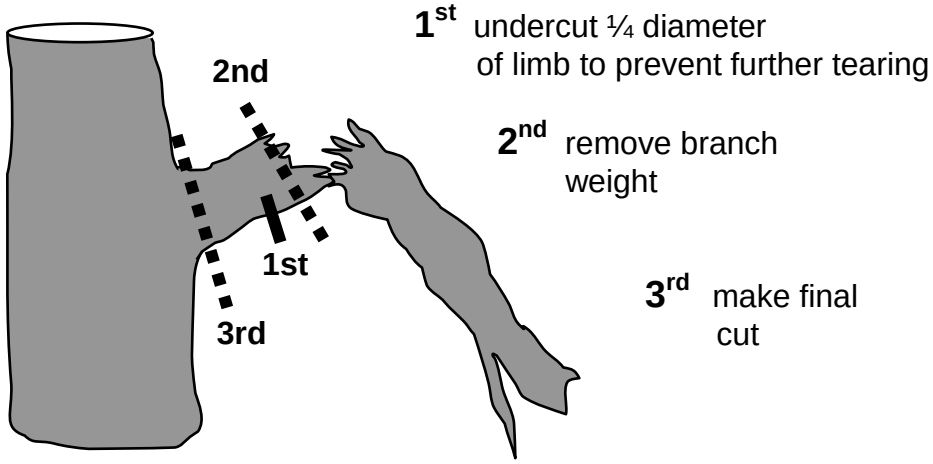

Figure 10.

Under no circumstances should a short section of branch be left on either a branch or along the main stem that is long enough to “hang a coat on”. Poor cuts will result in a dead “stob” protruding out of the side of the branch or stem that will die off allowing decay fungi and insects to attack the woody tissue inside the tree (Figure 11).

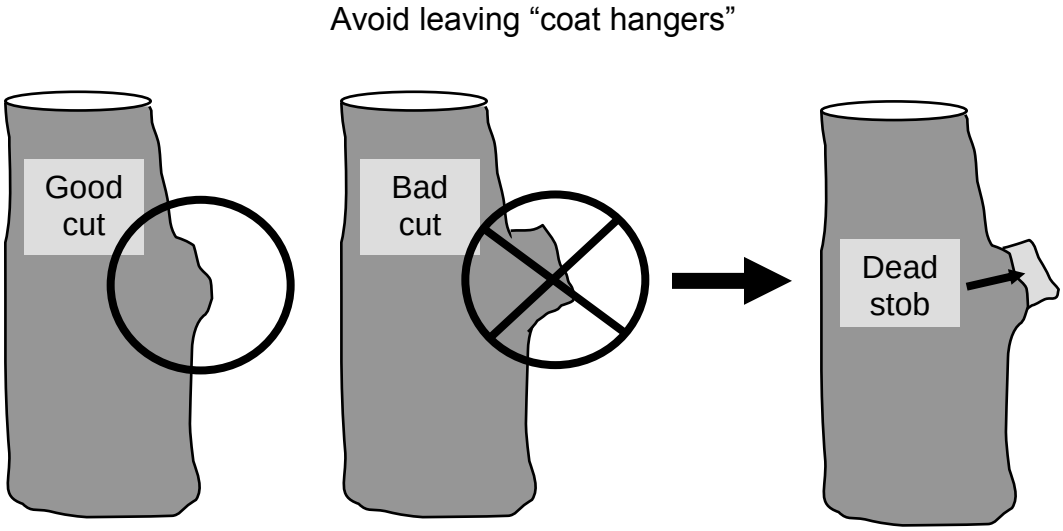

Figure 11.

If a break occurs far enough along a branch so that healthy branches with leaves or needles exist between the break and the main stem, it is possible to leave the healthy portion of the branch intact. The branch should be pruned back to where the healthy secondary branches protrude (Figure 12).

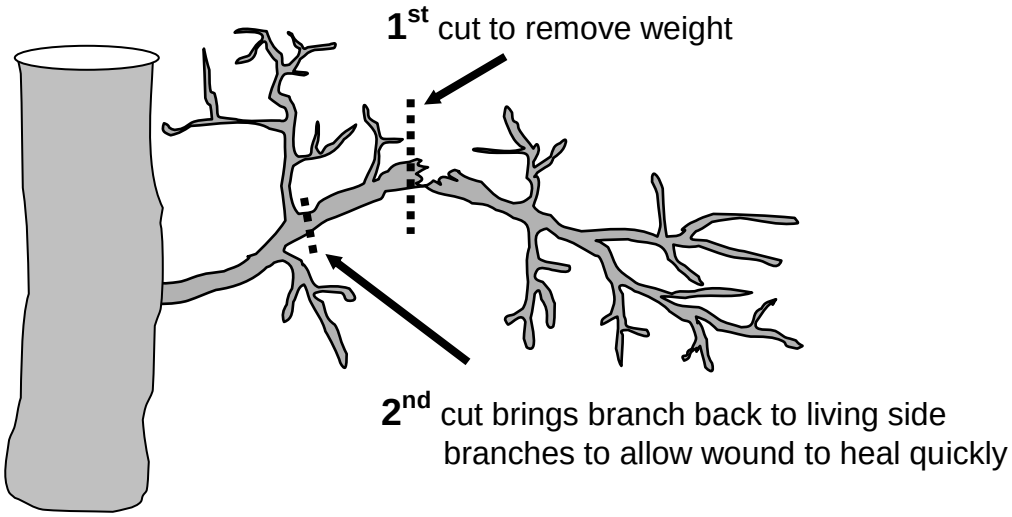

Figure 12

Another type of injury is referred to as a "split" limb (see figure 13). This is caused by a twisting motion. Severe splits will cause the rest of the branch to eventually die and also create a hazard to anyone or anything under the branch while other splits can heal. To help diagnose if this type of injury will warrant the removal of the branch, consider the following:

1) Is the twisted limb in a place on the tree where its removal will severely affect the shape of the tree? If not, it may be best to remove the branch.
2) Does the branch flop around in the wind or does it appear to be fairly secure? As the branch moves in the wind does the split open and close? If the branch seems fairly secure and the split does not flex noticeable the branch will more than likely recover.
3) Is the branch greater than 4 inches in diameter? If so, there is considerable weight on the branch and the split represents a dangerous structural hazard that can result in the branch breaking off unexpectedly.
4) Is the split greater than 1 inch wide? Splits larger than this rarely heal, and the opening will eventually allow wood decay fungi to enter the branch and further weaken it.
5) Finally, if there is no immediate danger of the branch falling off in a heavily traveled area, wait and see if the branch recovers – this should only apply to a branch that is split but has not changed its structural position (not hanging crooked).

When removing a split limb, it is important to follow the proper cutting procedure. Since the limb is already split, improper cutting can cause the split to enlarge and potentially cause much more serious damage to the tree. Also, cutting directly through split will often bind your saw creating a dangerous situation.

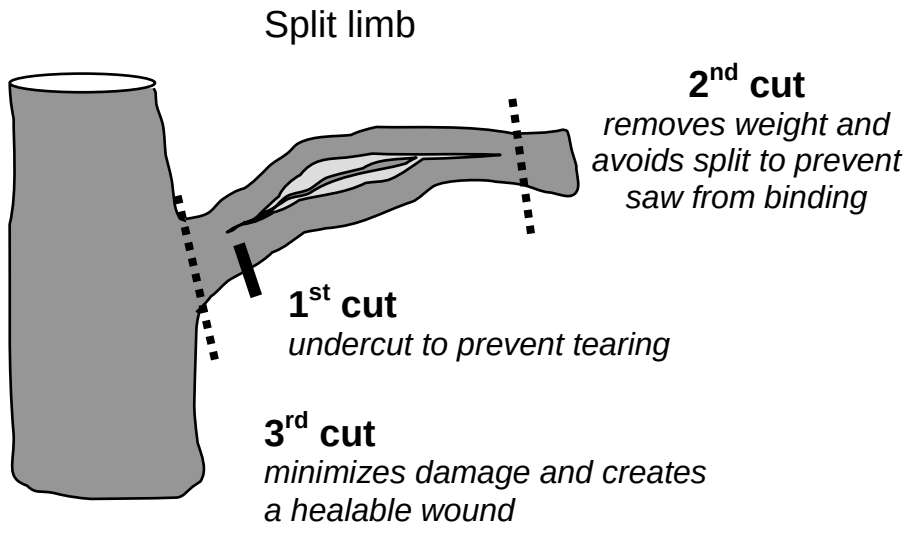

Figure 13.

The final type of injury is created when the torque of the wind causes a branch to be torn out of the main stem of a tree or from a larger branch. This usually creates a large gaping injury where a strip of bark has been pulled away from the remaining tree along with the branch. Although there is little that can be done to "fix" this type of injury, proper treatment can help this injury heal more quickly. Much like a broken branch, the remaining living bark will slowly grow over the injured area. The smoother the exposed woody tissue, the faster the new bark will grow over it.

Using a sharp wood chisel or saw where necessary, trim off any wood splinters protruding from the injury. Like wise, any bark that has been pulled loose from the stem will die, therefore trim loose bark back to where it connects with the solid wood of the stem. Caution must be used when doing this to avoid creating larger injury! Since water from the roots and sugars from the leaves travel in an upward/downward direction, try to leave the injury in a teardrop or elliptical shape (see figure 14). Although the use of pruning paint has not been shown to affect the healing process, it may be applied to injuries such as this to lessen the visual impact and potentially reduce air damage to the living tissue under the injury. Only use properly designated pruning paint as any petroleum based product such as tar or oil paint will damage the surrounding living tissue and create a much larger injury!

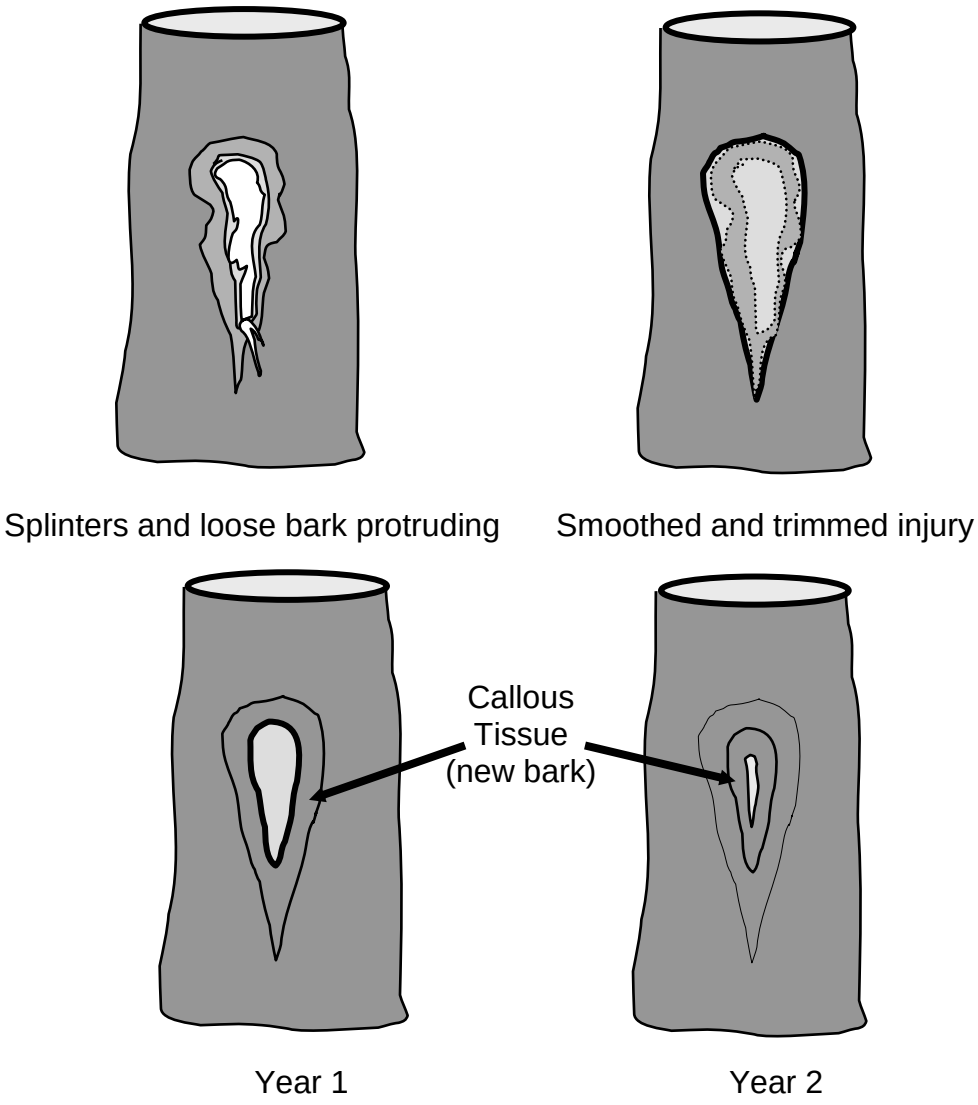

Figure 14.

Occasionally, a tear will create a deep depression in the wood which will hinder good callous formation across the injury. A concrete packing is sometimes used to create a smooth surface to enhance the healing process. The concrete is mixed on the dry side so it is not runny, next it is tightly packed into the depression so that the outside layer is flush with the barkless wood. A

damp rag is then used to polish the concrete to make a smooth surface. The resulting packing should create a profile that looks exactly like the stem of the tree with the bark removed. This last part is critical because a protruding concrete packing will create just a large a barrier to the new bark as the original depression did. The final step is to record where you put the packing so that any future tree trimmer will not hit the concrete with a saw (which can be very dangerous with a chainsaw).

How much injury can a tree survive?

Sometimes trees are injured to such an extent that tree removal and replacement are the best options. Making such a decision will be based upon the tree species involved and what you the landowner desire. Some tree species such as willows, cottonwoods, green ash, and Siberian or Chinese elms can virtually grow new branches from a stump. The advantages of such a situation are that you will have a tree (of sorts) back fairly quickly.

After pruning trees – to paint or not to paint?

During any seminar or workshop about pruning trees the question always arises: Should a person paint pruning cuts with pruning paint? Years ago studies in the Midwest indicated that the use of pruning paint showed no appreciable positive benefit to trees and in some cases actually seemed to promote more rapid wood decay by trapping moisture and decay fungi in the wood. From this has come the general recommendation that pruning paint is not worth the time and money. That being said, more recent studies concerning tree physiology have shown that in dry climates with low humidity, a tree's largest stress is water deficit. More specifically, cavitation or air embolisms of the xylem tissue (the tree sapwood) can cause irreparable loss of function to this water transport system within a tree. Similarly, wounding can cause similar damage in the form of air embolisms within the sapwood tissue. Loss of xylem function results in a trees inability to adequately supply its leaves with water during periods of high vapor density deficit (low humidity – I just wanted to sound smart!). The larger the pruning wound to stem diameter ratio, the larger the potential negative impact on the xylem tissue. For example, a I-inch cut on a 1.5-inch diameter stem can result in a loss of function on more than 50% of the xylem at that cut, versus a 4-inch pruning cut on a 12-inch diameter stem which could result in a loss of 10% xylem function. Although the original intent of pruning paint was to keep pathogens out, there may be some merit to using pruning paint that keeps sapwood tissue underneath a pruning cut or other wound from drying out. It is important that only genuine labeled pruning paint be used. Roofing tar or asphalt contains petroleum distillates that will kill living plant tissue. Most conifers such as pines and spruces will naturally seal wounds with pitch and therefore would not benefit from pruning paint. Cosmetic application of pruning paint for tree-owners that object to seeing the pruning cuts should not negatively affect trees in our dry climates.