HOW WOUNDS INJURE TREES

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Wounds on trees start processes that could lead to disease, decay, and death. Wounds injure tissues and give pathogens easy entry into trees. Wounds are common on all trees. If this is so, and, if wounds can start processes that kill trees, why do we see so many trees with wounds, and the trees are still alive? Let us start this discussion by renewing some basic information on tree biology.

The Compartmented Tree

Trees are highly compartmented, woody, perennial, shedding plants that are usually tall and single-stemmed. Trees are generating systems. The cambium produces new cells in new spatial positions every growth period. Trees cannot restore injured or infected cells. Restoration means to repair or replace in the same spatial position. Healing in animals is a restoration process. Trees cannot heal. However, trees do have a very effective defense system to deal with wounds and infection. Trees are built up of many compartments that have strong boundaries. After wounding and infection, trees respond to resist spread of pathogens by strengthening the built-in boundaries, and later by forming a new boundary that separates the infected wood from the new wood that continues to form after wounding. This defense process is called compartmentalization. A model of the process is called CODIT, an acronym for Compartmentalization Of Decay In Trees.

Compartmentalization makes it possible for trees to have hundreds or even thousands of wounds and yet the trees will still be alive. But, like healing, compartmentalization is not an absolute process. It does have its limitations.

How Trees Die

Trees, like all living things, die three basic ways: 1)mechanical disruption, 2) dysfunction, and 3) infection and starvation. Mechanical disruption means that the organism is so broken that it cannot continue to function. Dysfunction means that vital parts cease to function properly. Infection means that some other organism of another species--pathogen--has drained energy from the host. Energy drainage and starvation are similar. Trees starve when essential materials become depleted, and when storage space within the tree for energy reserves is reduced.

Wounds can kill many cells and wounds can kill trees by mechanical disruption. Wounds may also lead to disruption in transport of substances in trees, and this causes localized dysfunction. But, most important, wounds can lead to infection and starvation.

Wounds and Compartmentalization

If trees can compartmentalize wounds, then how can wounds lead to starvation? Trees must store energy reserves in living cells. Parenchyma

cells in sapwood store energy reserves. Sapwood has many living cells. When wood is wounded, compartmentalization starts. The boundaries not only wall off the pathogen, but they wall off cells that normally store energy reserves. So long as the tree has time to generate new cells in new spatial positions, all will be fine for the tree. But, when wounds repeat faster than the generation processes, then the tree will be in trouble.

When energy reserves are low, many opportunistic pathogens spread rapidly in the tree.

What does this mean for the working tree person?

1. Wounds must be prevented. Stop lawnmower wounding. Lawnmower wounds repeat. When an operator continues to wound trees, lay the person off without pay for several days. This is the cure.

2. Prevent construction wounds. Make plans before construction starts. Meet with the people who will operate the machinery. Let them know that a high penalty will be issued for every wound. Then, if wounds are inflicted, do not hesitate to penalize the operators. Money talks!

3. After construction. When roots are injured, make smooth cuts to remove injured wood. Do not fertilize injured trees until they show signs of recovery.

4. Pruning. Do not injure or remove the branch collar. If possible, avoid pruning when leaves are forming, and when leaves are falling. Do not paint pruning cuts.

5. Wound treatment. Scribe wounds to remove injured bark and wood. Scribe as shallow as possible. Do not point the vertical margins. No need to scribe in the shape of a vertical ellipse. Do not enlarge the wound. Make all margins rounded. Do not paint the wound.

6. Graft wounds. Be on the alert for incomplete graft unions. The incomplete union is the same as a wound. Do not plant trees that have a deep indentation at one point on the graft union.

7. Timing of wounds. When wounding is a part of a treatment--injections, implants, cabling and bracing--avoid, if possible, wounding the tree when leaves are forming or when leaves are falling.

8. Wounds made by vandals and rodents. Vandals and rodents may girdle trees. If you can treat the wound within a few days after it is inflicted, you may be able to save the tree. Place wet moss on the wound and wrap the entire wounded area with black plastic. Check under the plastic for new bark after 2 months.

9. Wound patterns. When screws or other hardware must be put into trunks, do not make wounds in vertical alignment. The same patterns should be followed when injections or implants must be repeated. Do not make new wounds directly above or below old wounds. When injecting, make wounds at the base of the tree, not in the roots. Make wounds as shallow and as small as possible. Never inject or implant more than a centimeter into the wood.

10. Wounds and hazard trees. Be on the alert for wounded trees that may be potential hazard trees. Check carefully trees that are growing where many people gather or walk. Check trees that have been recently exposed because of construction. Look for large dead and dying branches. Look for large living branches that have grown into the new space provided by the construction activity. Check roots for decay and fruit bodies of fungi. Be especially on the alert for vertical cracks that are on opposite sides of the trunk. Wounds from old improperly cut large branches are high risk indicators or potential trouble. Do not take hazard trees lightly. They can (and are) killing people.

11. Wounds and wildlife. Many animals use cavities for homesites, nesting, and protection. Wounds start the processes that lead to cavities. The best wildlife trees are large, old, healthy trees that have a few well compartmentalized cavities. We must maintain wildlife trees in such a way that they do not pose a high hazard risk to property and people. If a wildlife tree is a high potential risk, consider a fence and a sign to keep people away. Proper cabling and bracing may also help to keep a wildlife tree safe. We must consider wildlife in our tree plans. But, we must do it in a safe way.

12. Wound dressings. Do not apply paints or dressing materials on wounds. Some materials may stimulate callus formation, but callus and decay are not related. Large callus does not mean small amounts of decay. There are no data to show that ant material stops rot. There are no data (that I am aware of) that shows that wound dressings prevent transmission of disease by insects. Insects commonly disseminate spores, but dissemination is not the same as transmission. Transmission means that disease symptoms take place. Beware of people who have all the answers on the wound dressing subject, but have never conducted experiments with controls, isolated microorganisms, and most importantly, have not cut and dissected many trees. Hundreds of trees were cut and dissected in our wound dressing studies, and the results have been published.

    The wound dressing subject will never go away. The search for the perfect wound dressings will continue. Recent reports from researchers working on wound dressings on orchard trees showed that the dressing caused more injury than the nontreated controls.

Final Point

If you really want to help trees, start by learning more about how trees grow, how they defend themselves, and how they decay and eventually die. A new tree biology is emerging. And, from this new information many adjustments are being made in the ways trees are treated. The new information can help us to help trees help themselves to be more healthy, attractive, and hazard-free.