ANATOMY OF A WOUND

How City Trees React . . . How They Can Be Helped

By Alex L. Shigo and Edwin vH. Larson
Respectively, Chief Plant Pathologist and Editor,
Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture

CITY TREES are especially vulnerable to wounding. They are wounded by automobiles, garbage trucks, lawn mowers, snow plows, construction equipment, people, birds, insects, animals, fires, ice, and storms. Few city trees reach maturity without receiving many wounds.

Any part of a tree can suffer wounds: roots, trunk, branches. Trunk wounds — such as those made when a skidding car gashes the side of a tree — are easy to see. Root wounds may be hidden. Many young trees are wounded during planting, and the wounds may be covered with soil.

Yet the most common and most serious wounds on city trees usually go unnoticed — branch stubs. All trees lose some branches during their lifetimes. After a windstorm, you may see broken branches lying on the streets; but you won't see where they came from. The stub or open scar that remains after a branch is broken off, dies from natural causes, or is pruned improperly, is a serious wound.

And any wound can open the way to the complex processes that can cause decay within the living tree. Even the wounds made by an insect or a nail driven into a tree could be serious.

If a tree is vigorous, the wound will heal rapidly. But if the tree is not vigorous, the wound will heal slowly. Then trouble starts for the tree: wood-inhabiting microorganisms get into it.

How Trees React

Trees respond to wounds in unique ways. After a tree is wounded, its defense system goes into action. First it forms chemical barriers in the wood behind the wound to prevent infection by microorganisms. These barriers stop most wood-inhabiting microorganisms most of the time. The wound then heals.

But in other cases, some aggressive wood-inhabiting microorganisms may get through the protective chemical barriers. Then the tree has another line of defense. The injured cambium produces a zone of special cells, a barrier zone that seals off — compartmentalizes — the wood that is infected by microorganisms. The sealed-off compartment is usually a column, no larger than the tree at the time it was wounded. The microorganisms may spread up and down within this compartment, causing the wood to discolor and decay; but they do not spread sideways into the new wood that formed after the tree was wounded.

The result is like a tree within a tree: the old infected tree inside, sealed off from the new tree around it, which year by year puts on new growth rings of healthy wood. So wounds on a tree do not always spell doom. If the young tree is kept vigorous, it will compartmentalize its injury and continue to grow.

But if the tree is wounded again, and again, and again, new compartments will form each time to seal off the infected wood. In time, a complex of infected compartments may so weaken the tree that it succumbs to other destructive forces.

Successions of Microorganisms

Many species of microorganisms are involved in the decay process: bacteria, non-decay fungi, and decay fungi. They infect wounds in a wave action. One group of microorganisms follows another, and each group launches its invasion force against the defense forces of the tree, as all are affected by an ever-changing environment.

Dissection of a healed branch stub on a paper birch tree. The decay microorganisms are compartmentalized within the tissues that were present when the branch died. When dead and dying branches are pruned properly, the wounds heal rapidly and the spread of decay is minimized.

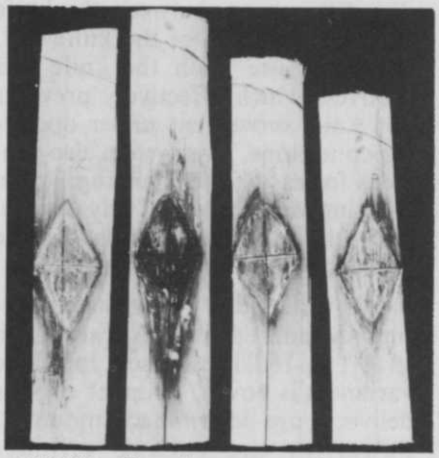
And microorganisms react to each other. One kind may open the way for another kind to invade the tree. Or one kind may block another from infecting the tree.

It takes time for microorganisms to get established in a tree. This gives us time to help the tree after it has been wounded. We know now that it is possible to disrupt the successional pattern of destructive microorganisms by purposely infecting the wound with another fungus. This stalls the decay process and gives more time to help the tree.

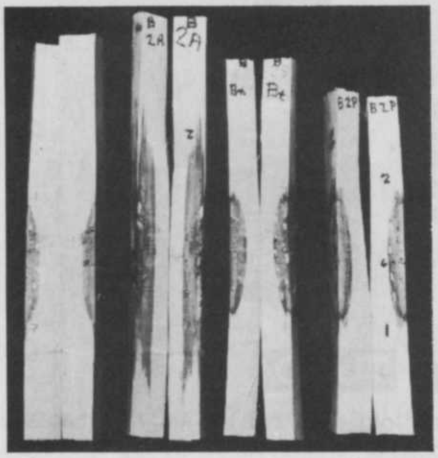
So what do you do for the tree? One thing you should not do is smear some wound dressing on the wound and forget it, thinking you have done all you can to help the tree. Wound dressings do not stop decay.

After a tree is wounded, you should remove the injured wood and bark with a clean sharp knife, so that healthy bark is in contact with sound wood at the margins of the wound. Usually this means enlarging the wound, in the shape of a lens.

Then do everything possible to increase the vigor of the tree. Properly prune dead and dying branches; fertilize and water the tree; and thin out less valuable competing trees. After all these steps



ABOVE: Four 1-year wounds on a red maple tree after treatment with wound dressings. Left to right: untreated; asphalt-base dressing; orange shellac; and polyurethane varnish. BELOW: Dissection of wounds shown above reveals discolored wood. Studies of 160 wounds on 40 red maple trees after 4 years indicated that none of the wound treatments reduced the amount of discolored and decayed wood.



A wound on the base of a red maple tree. Trees do not repair or replace wood injured by wounds. The injured wood is walled off or compartmentalized. After a tree is wounded, help it to help itself by doing everything possible to increase its vigor. This will bring about faster compartmentalization of the injured wood.

have been taken, you can apply some wound dressing — only to indicate that someone has treated the tree.

Too often people think that trees are so big and strong that they can withstand anything. Not so. The wounding of city trees is a serious problem now, and it will get no better unless something is done. One thing we can do is to develop sound tree-maintenance programs, using new information and new tools that have come from recent research on wounds and decay.

Selected References

The processes that lead to discoloration and decay within living trees are complex. Research is still being carried on to better our understanding of these processes. For more technical details, we suggest the following publications:

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CHIPPER *(from page 14)*

and a wedge which matches the taper of the knife. As the wedge is drawn down by its bolts, the flat side of the knife is pushed against the cutting cylinder, and the tapered side is locked against the wedge with no means of escape. Most of the above systems are resharpenable, adjustable and easily changed. Adjustments after sharpening are usually made by increasing the height of two setscrews beneath each knife, until proper clearance from the cutting bar is obtained.

Several other knife systems are also offered. One uses 12 or 16 individual knives, firmly secured with wedges. This system places its knives in a staggered pattern around the cutting cylinder; the knives are sharpened on both ends and are easily changed. Another straight-knife design has V-grooves cut in the back of the knife which match grooves cut into the cutting cylinder. Gib screws, between the knife and opposite side of the knife slot, exert pressure upon the knife and grooves, which effectively prevents any knife movement under operating conditions. This system also provides for easy knife changing. When working with knives of any system, it should be understood that they be handled with a cautious attitude.

As previously mentioned, cutting cylinder diameters vary from 11½" to 16."The reason for these variances is power. Chipper engines deliver a pre-determined amount of power to the cutting cylinder through a V-belt drive, with very little difference among competing ma-

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