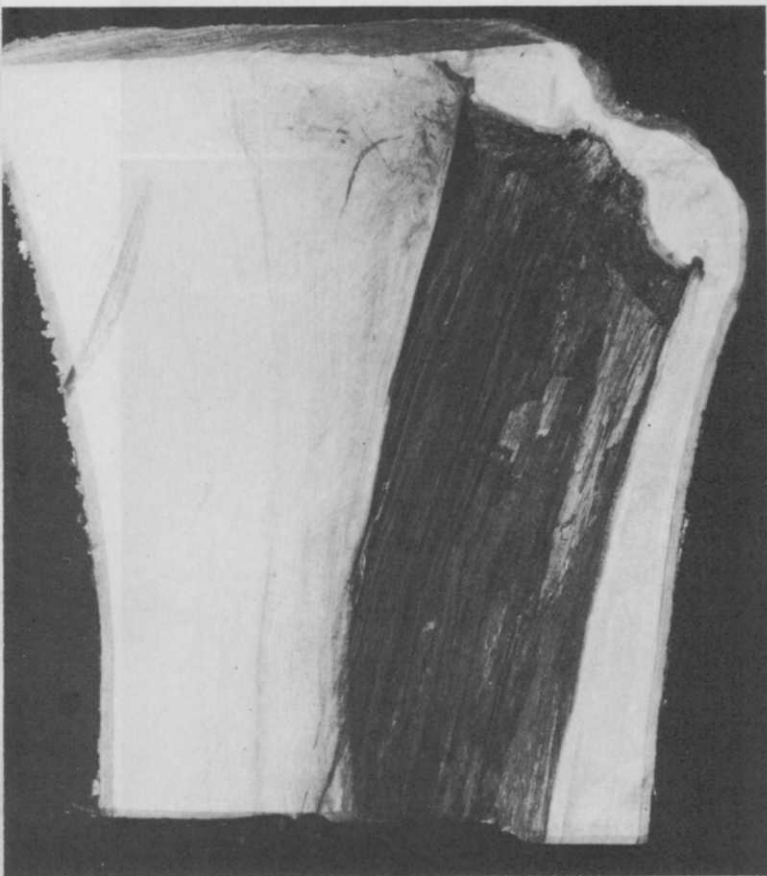


DEALING WITH DECAY FACTORS IN OUR URBAN FORESTS

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"You become responsible, forever, for what you have tamed."

(Antoine de Saint Exupery: The Little Prince).



The diameter of the hollow in the above tree was the diameter of the large stem at the time it was cut. The defect was compartmentalized. When cavities are filled, care must be taken to minimize breakage of the compartment rim surrounding the cavity. The diameter of the defect in the birch at right is the diameter of the tree when it was wounded. The defect was compartmentalized. The wood formed after the injury was not infected.

We have tamed our urban trees. We are responsible for their care.

A quick look at the condition of some of our urban trees will show that we have not met our responsibility. We seem to see more and more urban trees in trouble. Is it because we are becoming more aware of our trees? Or is it because the condition of our trees is declining? Probably both.

It is one thing to recognize a problem and another to do something constructive about it. What can we do to help our urban trees? Where should we start? Who should do it? Important questions. Here are some answers.

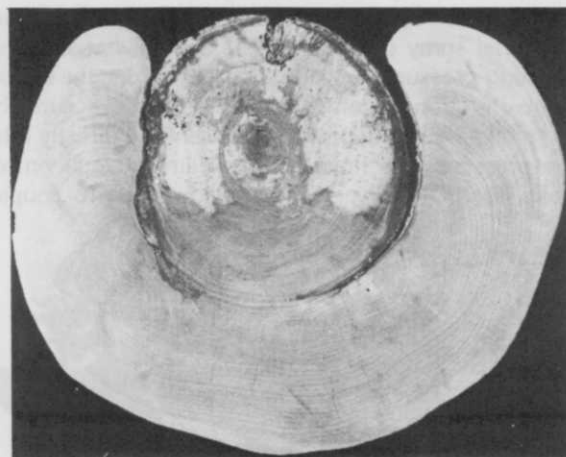
Awareness

Awareness of a problem is the first step toward solution.

Too many people take trees for granted. Trees are considered so tough that they are thought to be able to take anything and everything we and nature can throw at them. As long as there are a few green leaves on a tree, it is considered healthy by most people. Trees can take only so much abuse before they begin to wane. *We must start a national awareness program for the proper care of our trees.*

Myths and misconceptions

There are too many myths and misconceptions about proper tree care, for several reasons: 1) Tree care procedures are often based on incomplete or incorrect information. 2) Someone did what he thought was correct many years ago and the procedure has never been challenged or changed. 3) People often try to "play doctor" with trees and treat trees as they think a human doctor would treat a patient—clean the tooth cavity thoroughly, dress the wound with some protective and healing material, inject with a variety of materials, etc. Indeed, it is time to take a hard look at some of our tree care procedures.



First aid for trees

We need answers from research to help us with many tree problems, although we do have an abundance of sound information on proper tree care now. The trouble is that old sound information is not being used and the person who needs the new information has not received it in a form that enables him to understand and use it. To solve the first problem, we must enforce or "put some teeth" into tree care contracts to make certain that well known sound principles and practices are followed. For example, there is no excuse for planting improperly, planting off-site, and pruning improperly, when we have sound information on these procedures. Yet our knowledge of these basic procedures is too often not followed.

To solve the second problem we must find better ways to package new information so that it will reach the people who need it. What's the use of "knowing the secret of life" if you can't tell somebody about it in a way he will understand? It is the responsibility of the researcher to package new information. It is time to take a new look at our tree care procedures.

Forest tree — urban tree

When a tree is sick, it is sick. This is true regardless of where it is growing, in the forest, in your yard, or along a city street. It is time we recognized this. But there are some problems unique to urban trees: Most urban trees are planted. Sometimes trees are planted off-site or in the path of stress and wounding agents—lawnmowers, cars, snowplows, etc. The off-site tree or constantly stressed tree will wane and die.

Forest trees grow under a wide variety of stresses. Only the toughest survive. Urban trees coming from the safety of a nursery never experience wounding and other stresses until they are planted. Care must be taken in using information about forest trees for urban trees. But some basic information can be used for both forest and urban trees.

Expanded concept of decay

Decayed wood associated with wounds has been, still is, and no doubt will continue to be a major problem of all trees throughout the world, regardless of where they are growing. The classical concept of tree decay emphasized characteristics of decayed wood, taxonomy of decay-causing fungi, and predictions of the proportion of cull trees for great numbers of trees in forests. The expanded concept of tree decay includes tree response to wounding and infection — Compartmentalization — and the interaction of many types of microorganisms in the processes that can lead to discolored and decayed wood — Succession. Compartmentalization and succession are orderly processes. Order can be regulated and understood. The more we understand the order of the decay processes, the better are our chances of regulating them.



Commonly used asphalt-based wound dressings do not stop decay. The tree above was improperly pruned and coated with a wound dressing. Such treatment does more harm than good.

New decay model

A model—CODIT, Compartmentalization Of Decay In Trees—describes how discolored and decayed wood develops in living trees. On the basis of the expanded concept of tree decay and CODIT many tree care procedures have been re-examined. Here are some examples:

Wounds are major problems

Wounds are a major cause of injury to urban trees. Wounds start the processes that can lead to decayed wood; which can lead to hazardous, unattractive, and low-quality trees. Root, trunk, and branch wounds inflicted during construction of buildings and roads rank as a major type of injury. The injury is often not obvious until 5 or even 12 years later.

Trees do not heal wounds

A wound is a break in the bark that exposes the xylem. Once xylem is injured it is never repaired, replaced, or restored to its previous healthy state. In this sense, trees do not heal wounds. (Heal means to restore injured tissues to their previous healthy state.) Trees wall off or compartmentalize

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wound xylem. Compartmentalization is an alternative to healing that has great survival value for trees.

Wound dressings do not stop decay

Commercially prepared wound dressings—particularly the asphalt-based types—do not stop decay. When applied in a thick coat they can cause more decay. The dressings are primarily cosmetic for the tree and psychological for the tree owner. When wounds are treated, three factors must be considered: 1) closure, which is related to current growth rate; 2) dieback of cambium around the wound, which is related to time of wounding and position and severity of the wound; and 3) internal walling-off or compartmentalization of decay, which appears to be under genetic control.

Biological control treatment of wounds

Results of recent research suggest that biological control agents such as the fungus *Trichoderma harzianum* delay the invasion of decay-causing fungi for at least 2 years in red maple. Research with other materials at the author's laboratory show that wound dieback can be decreased, and that other treatments delay the development of decay.



A decayed tree posing a threat to a greenhouse and residence. Too often people learn about decay too late.

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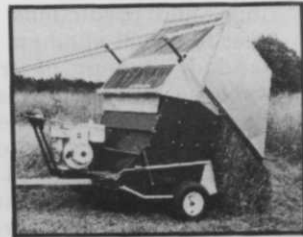


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Compartmentalization appears under control

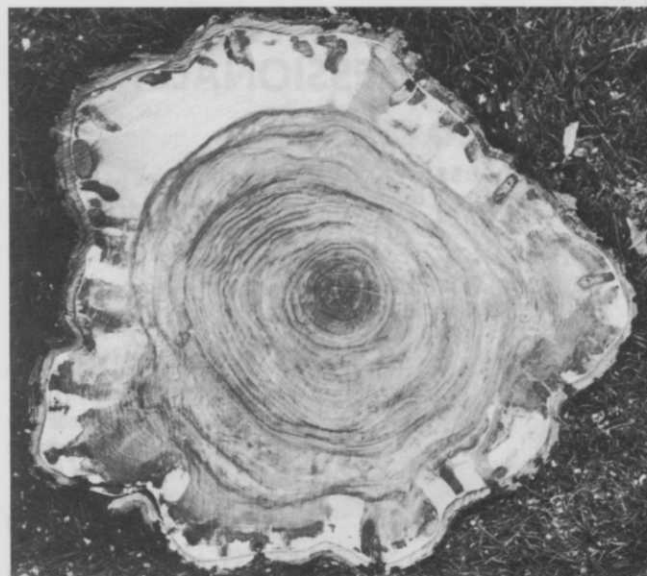
Compartmentalization of injured and infected wood appears to be under genetic control. Some trees of the same species can compartmentalize decayed wood to a smaller volume than other trees. This means that we may be able to select trees that can withstand the stress of many wounds over many years, and still have only small columns of decayed wood. This brings us closer to having decay-resistant trees.

Pruning can be good or bad

Proper pruning can help a tree; improper pruning can hurt a tree. A proper pruning program should be established early in the life of a tree and continued throughout its life. The best time to prune is late in the dormant period. The worst time is when the leaves are expanding, or soon after the leaves begin to fall. In the spring the bark is loose and dieback may develop. In the fall, wood-inhabiting microorganisms produce an abundance of spores that can infect wounds. When pruning dead or dying branches do not cut the living callus collar around the stub. This is an instance where flush cuts are not recommended.

Hazard trees: new detection methods

Decay can make trees hazardous. An electric pulsed-current meter—the Shigometer®¹—gives



Cross-section of the base of an elm tree that had received numerous injections for prevention of Dutch elm disease. Deep injection wounds repeated for several years can cause severe internal injury.

information that can be used to detect decayed wood rapidly and accurately in living trees. The new electrical method can also be used when



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cavity fillings are planned. The proper installation of rods and other hardware can then be determined. The proper use of the Shigometer requires some skill and practice.

Cavity filling: don't play dentist!

When cavities are filled, great care should be taken not to clean out the decayed wood so thoroughly that healthy wood is injured from the inside of the tree. The decayed wood is compartmentalized in the tree by a tough rim of protective tissues. If this protective rim is broken from the inside, decay will spread rapidly from the cavity to the surrounding healthy tissues. Cavities can still be filled for aesthetic reasons or to form a base for the inrolling callus.

Proper bracing and cabling

The time a tree can remain safe and attractive can be extended by proper cabling and bracing. When hardware is put into healthy tissues, the injured wood will be compartmentalized. But when holes are put into decayed wood, the decay will spread rapidly into the surrounding healthy wood. When hardware is used in a trunk that has decay, the rod must go *completely* through the stem, and washers must be placed on the outsides. The washers will hold the rods in place even though decay may develop around the rod. Do not dead end rods that penetrate decayed wood.

Injection wounds can injure trees

Many holes are being drilled into trees to inject chemicals. Great care must be taken when injecting chemicals. A hole is a wound. Deep drill wounds repeated for several years can cause severe internal injury. When internal columns of injured wood coalesce, large pockets of dead wood will result. Dieback around deep injection holes can also lead to cankers. When injections are necessary because of infection, the holes should be as few, as shallow, and as clean-edged as possible. Until better injection methods are developed, go very carefully!

Holes for draining water can cause problems

Holes drilled into decayed wood to drain water can cause severe injury to a tree. Decay will spread rapidly into the healthy wood surrounding the hole. But holes can be drilled into wetwood without spreading decay. Wetwood is a wood condition caused by bacteria; the wetwood is not decayed.

Seams usually start from wounds

Large, deep invaginated cracks, commonly called frost cracks, are usually not initiated by frost. Wounds start the processes. The cold or frost acts as a trigger. Most large so-called frost cracks start from the inside and spread outward. Weakened areas on the trunk also act as starting points for other types of seams, especially when temperatures drop rapidly. These seams are usually very shallow.

And remember, we have tamed urban trees and we are responsible for their proper care! **WTT**