



Rx For Wounded Trees

UNITED STATES
DEPARTMENT OF AGRICULTURE
FOREST SERVICE
AIB-387

FOREWORD

This booklet offers guidelines on how to care for trees to keep them healthy and to protect them from wounds. It also prescribes ways to prevent, recognize, and minimize damage by decay that most often sets in after tree wounding.

Rx FOR WOUNDED TREES is part of a USDA Forest Service program designed to provide information on the wise use and care of trees . . . some of our most versatile and renewable natural resources.

Other booklets in the series include: YOUR TREE'S TROUBLE MAY BE YOU, AIB-327, which shows how man most often injures trees; WOUNDED TREES MAR OUR ENVIRONMENT, NE-INF-17-73, which points out common types of tree wounds; and A TREE HURTS, TOO, NE-INF-16-73, which outlines the general process of decay. NE-INF-17-73 may be requested from the Forest Service Northeastern Station, 6816 Market Street, Upper Darby, PA 19082. The other publications are for sale at the Government Printing Office in Washington, D.C. 20402.

This series of tree care booklets was developed by Hal Marx, Forest Service Application Staff Assistant for Research, and is based on research in the Pioneer Forestry Project of Dr. Alex L. Shigo, Chief Plant Pathologist at the Forest Service's Northeastern Station. Acknowledgment is given to Dave Carroll, who illustrated the booklet.

On the Cover: An illustration of contrasts in a well-cared-for oak tree beside a neglected or improperly cared-for one. The tree on the left shows well-healed branch stubs and a well-healed basal wound, while that on the right has advanced decay associated with poorly healed branch stubs and an open, poorly healed basal wound. With a little wise care, we should be able to grow more trees like the one on the left.

TOO LATE

When a once-beautiful tree falls
on people, power lines, or
property, or when it is cut up
at a sawmill and found to be
of such poor grade wood that
no quality products can be made
from it, it's too late for care or
concern.

The time to begin caring for trees
is while they're still healthy—
long before they grow unsightly,
hazardous, or worthless.



1. Too late!

TREE CARE

A good tree-care program begins with a general understanding of man's role in relation to trees. In regard to your own trees, you will find that you usually have four possible courses of action to choose from. Which action you choose to take will have a profound effect on your trees. (See illustrations 2, 3, 4, and 5)

A good tree-care program includes looking for hints of trouble. There are a number of signs and symptoms that indicate the development of decay in a tree. All too often they go unrecognized until it is too late. However, early recognition of these signs

and symptoms, followed by proper treatment, can do much to prevent or minimize the damage caused by decay and the subsequent waste of so many good trees and so much valuable wood.

Before deciding on a plan of action, it is wise to consider these basic points about trees.

TREES take many years to grow.

The effects of planting a new tree or cutting and pruning an old tree will be felt years hence.

HEALTH of the tree is a major factor in all situations.

DISEASES are major causes of tree problems. The diseases

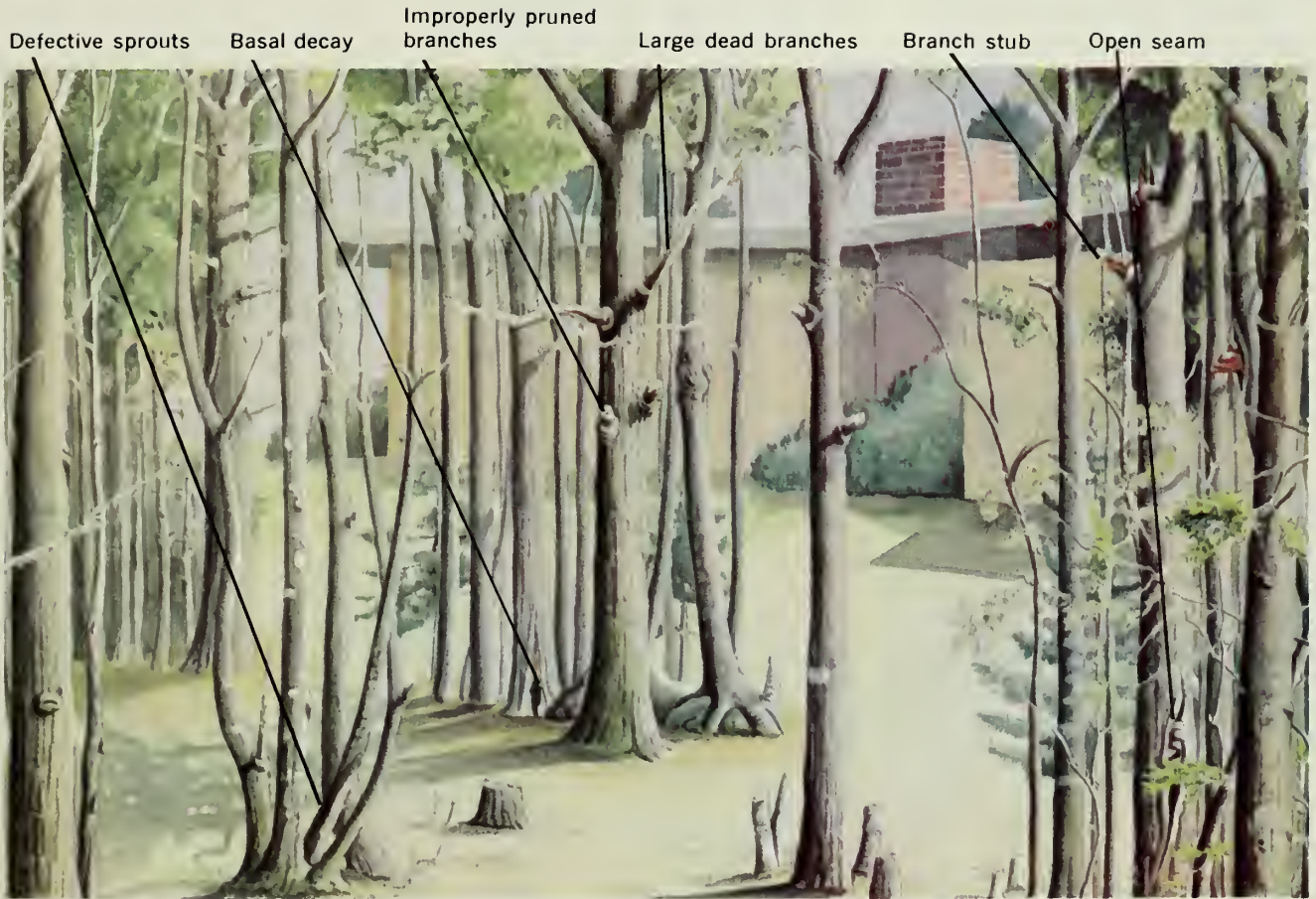
that cause the most damage are those associated with wounds.

WOUNDS start the processes that can lead to decay.

DECAY can lead to low quality, unsightly, and hazardous trees. Decay of wood in a tree is the final stage of a process that starts with a wound. Decay involves the action of many wood-inhabiting microorganisms over a long period of time.



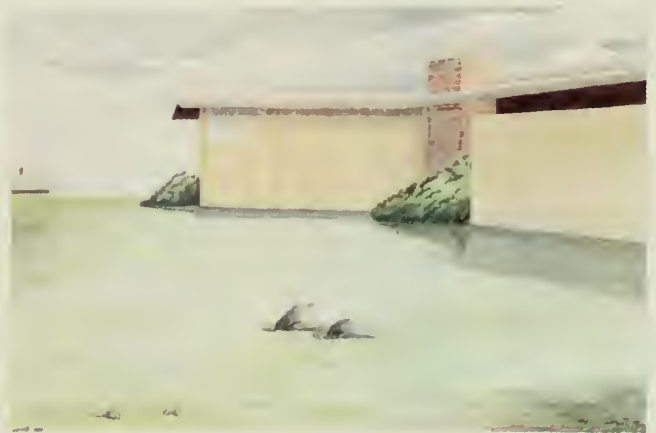
2. All trees can be left uncut to allow a natural or wilderness area to develop.



3. Some trees can be cut and pruned improperly.



4. Some trees can be cut and pruned properly.



5. All the trees can be cut.

TREE WOUNDS

A tree is considered to be wounded when its bark is broken so that either its inner bark or wood is exposed to the air. Tree wounds are caused by various agents, including birds, animals, insects, fire, mechanical equipment,

lightning, or man and his activities. Tree wounds are classified into three types, depending on their location: branch wounds, trunk wounds, and root wounds.

BRANCH WOUNDS

All trees lose some branches during their lifetime and the wounds from these branch stubs usually heal. But when they heal too slowly or not at all, the tree could be in for serious trouble. Poorly healed branch stubs are major entry points for

microorganisms that can cause decay.

These illustrations show what happens when a single branch stub does not heal. During the lifetime of a tree, the improper healing of branch stubs may

occur many times over, multiplying this effect.

Look for poorly healed branch stubs as reliable early signs of trouble. (See illustrations 6, 7, 8, 9, 10, 11, and 12)



RED MAPLE

6. Healthy tree and branch

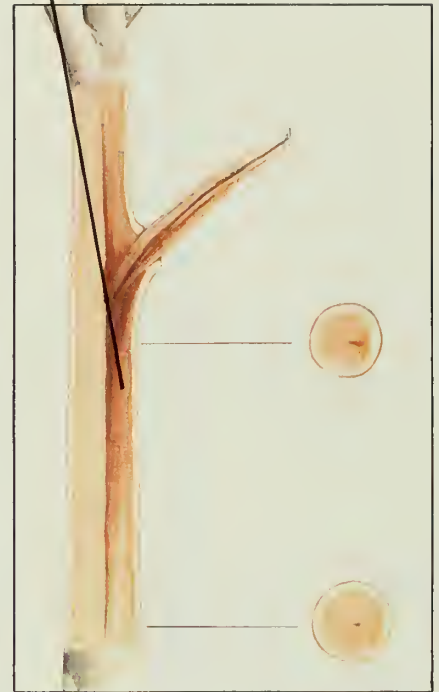


7. Broken branch

Decay confined to wood present when branch broke



8. 1 year later

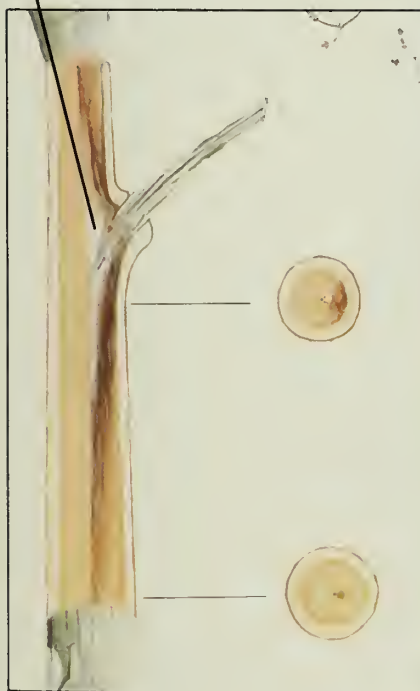


9. 3 years later

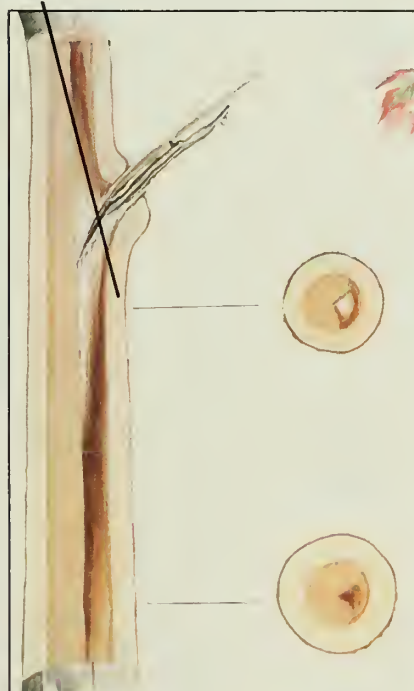
Decay starting to set in

Wood that formed after the branch broke is not infected.

Decay is compartmentalized. Hollow beginning to develop



10. 10 years later



11. 20 years later



12. 40 years later

TRUNK WOUNDS

There are many types of wounds on trunks, and most will heal.

These drawings show what happens when a trunk wound becomes infected. This situation might be repeated many times during the life of an individual tree.

Poorly healed trunk wounds are also early signs of trouble.
(See illustrations 13, 14, 15, 16, 17, 18, and 19)

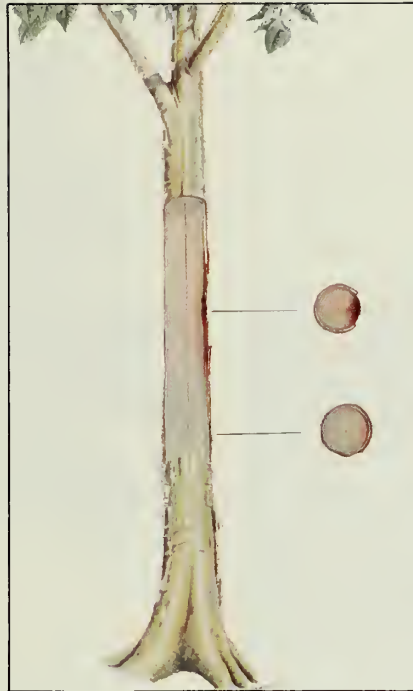


13. Healthy, nonwounded birch

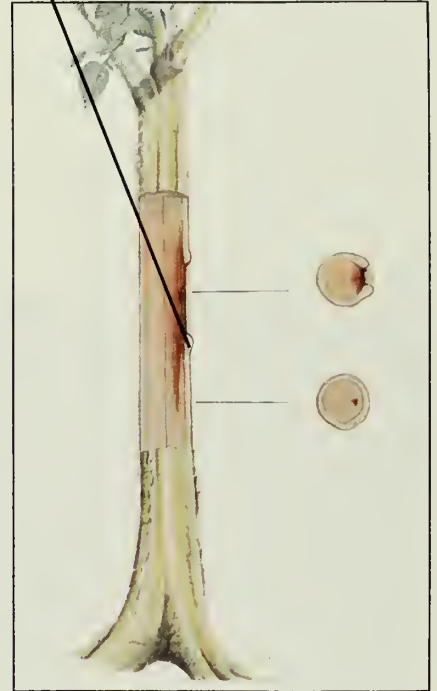


14. Wounded birch

Wood that formed after the wound was not infected.



15. 1 year later



16. 3 years later

Decay starting to set in



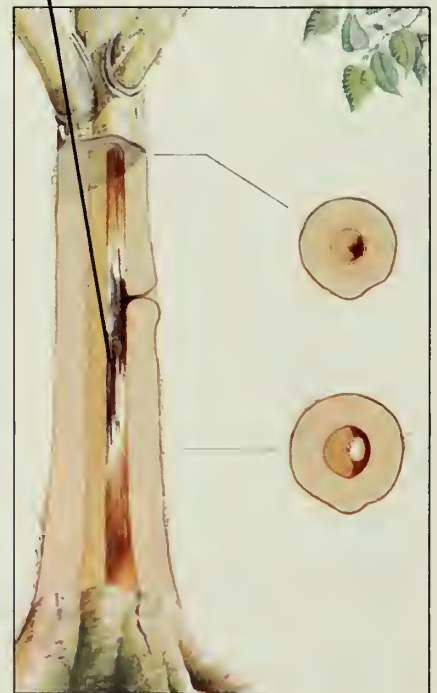
17. 5 years later

Decay confined to wood present when wound was inflicted



18. 20 years later

Hollow developing



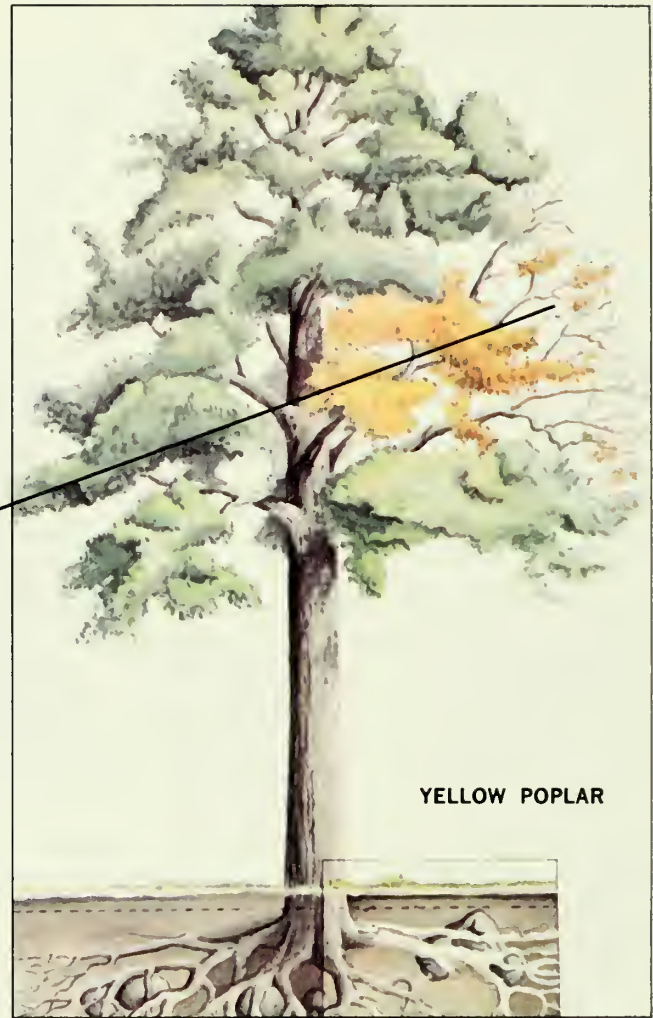
19. 40 years later

ROOT WOUNDS

Roots are often wounded during the construction of buildings and roadways, patios, and swimming pools, unless measures are taken to prevent root injury. Following construction, soil is sometimes piled on top of these injured roots, so the wounds do not show. Injured roots weaken the foundation of the tree and with time and the advancing decay process, could cause such a tree to eventually blow over in a storm.

Be on the alert for root injuries up to 10 years after any kind of construction work in the area. Dead and dying branches on one side of the tree's crown are often early signs of root injury on that side. If you suspect root injury, watch the tree's vigor closely and do everything possible to increase its vigor. Such measures include watering, fertilizing, pruning, and thinning out other, less valuable surrounding vegetation. If additional branches begin to die, consult a professional and consider removal of the tree before a costly disaster strikes. (See illustrations 20 and 21)

Branch death
above root
wounds



Decay in roots



20. A hazardous situation can develop as injured roots begin to decay.

21. Dying branches are often associated with injured or decayed roots.



Soil fill over
injured roots

Roots wounded during
construction

HOW TO PREVENT WOUND PROBLEMS

First test the vigor of a branch to see if pruning might be necessary. (See illustration 22)

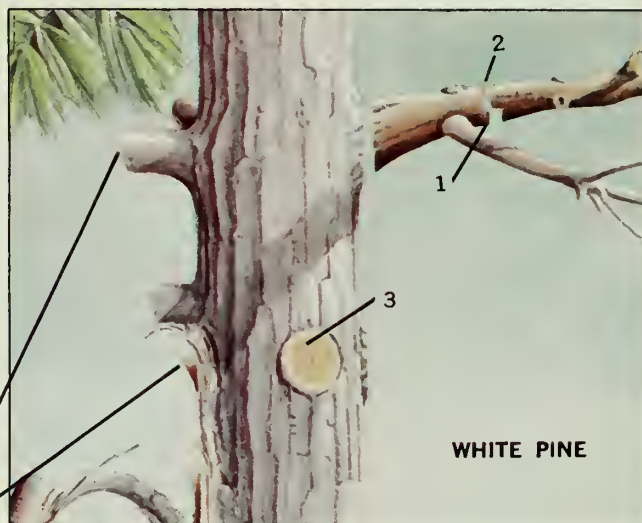
If pruning is necessary, prune dead and dying branches properly to help the tree heal its branch wounds faster and to reduce the chances for infection that could lead to decay. (See illustration 23)

Proper pruning will help the tree, while improper pruning only causes the tree more trouble . . .

Serious trouble can result from improper pruning:

Proper pruning

1. Undercut
2. Upper cut to remove branch
3. Flush cut



Improper pruning

- Stub too long—improper cut
- Split below stub—injury to stem

23.



22. Bright green
High vigor



Dull green
Bark wrinkled
Poor vigor



Brown
Bark very wrinkled
Dead branch

CANKERS

Canker-causing microorganisms often become established on dying branches before invading the trunk. Most cankers start from poorly healed branch stubs.

SPLITS

The bark often splits above and below poorly healed branch stubs. These splits are additional entry points for trunk-infecting microorganisms.

Perennial canker on cherry



24. Cankers or localized dead area

Split below old stub



25. Splits

HOLLOWS

Water often fills the hollows associated with very old branch stubs. Do not bore a hole to let water out of a hollow, because this will permit decay to spread into the healthy wood that surrounds the hollow. (See illustrations 26, and 27)

Water in hollow associated with old stub



26. Hollows

New column of decay around hole



27. Hollows

Prune old dead stubs properly.
(See illustration 28)

Many microorganisms use old dead stubs as springboards into the trunk. (See illustrations 29 and 30)

When a tree top is broken, prune the broken top. A vigorous branch near the broken top usually becomes the new leader. When pruned properly, the tree will heal its wound faster and the likelihood of decay developing decreases. If decay does develop, it is usually limited to the old leader. (See illustrations 31, 32, and 33)

Prune away any branches that might be on a collision course with a building, powerline, or path. If cut when it is still small, its wounds will heal faster and decay will not start. Branches do not raise in height as a tree grows. (See illustrations 34, and 35)

Callus ridge



28. Proper pruning

Decay associated with old dead stub

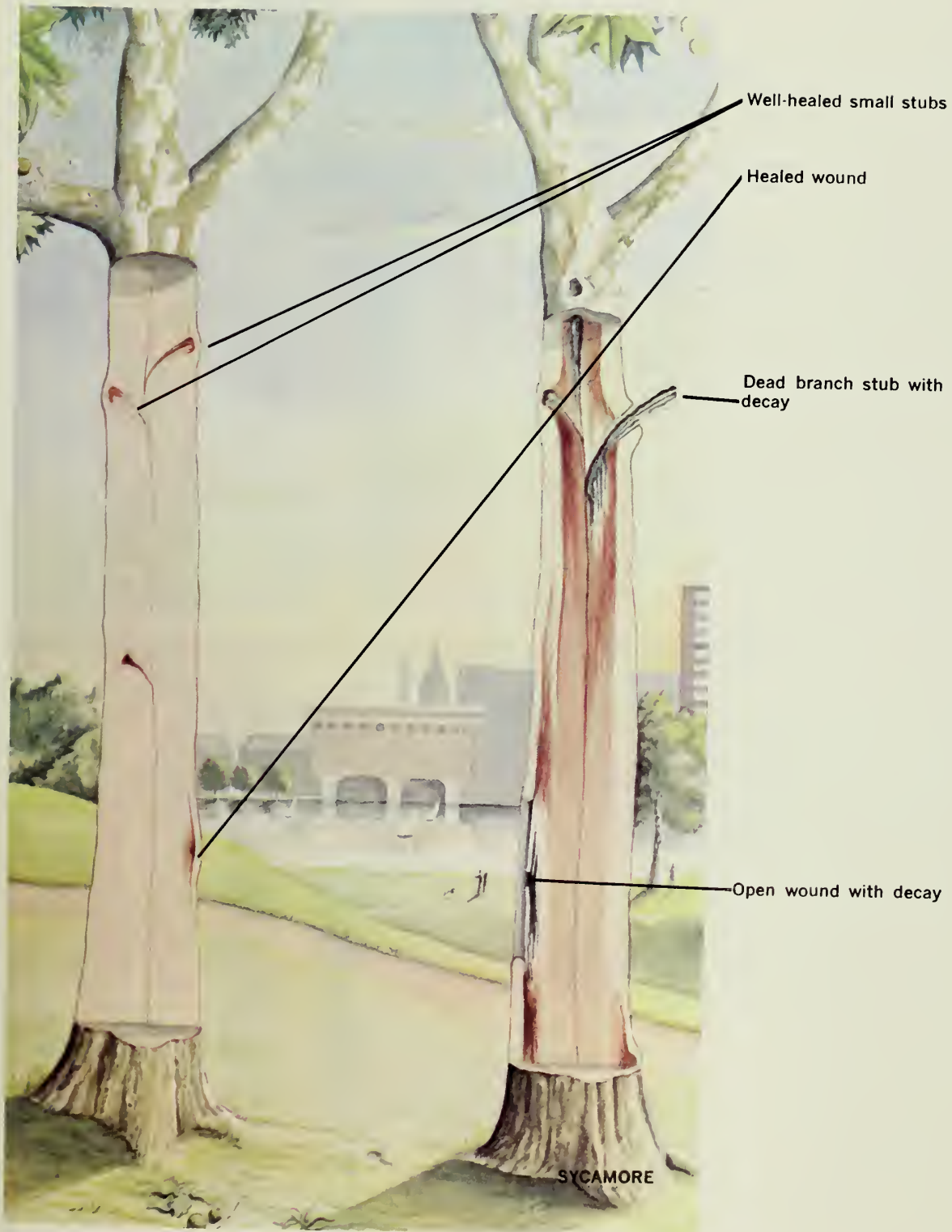
New wound inflicted here



Improper pruning

Proper

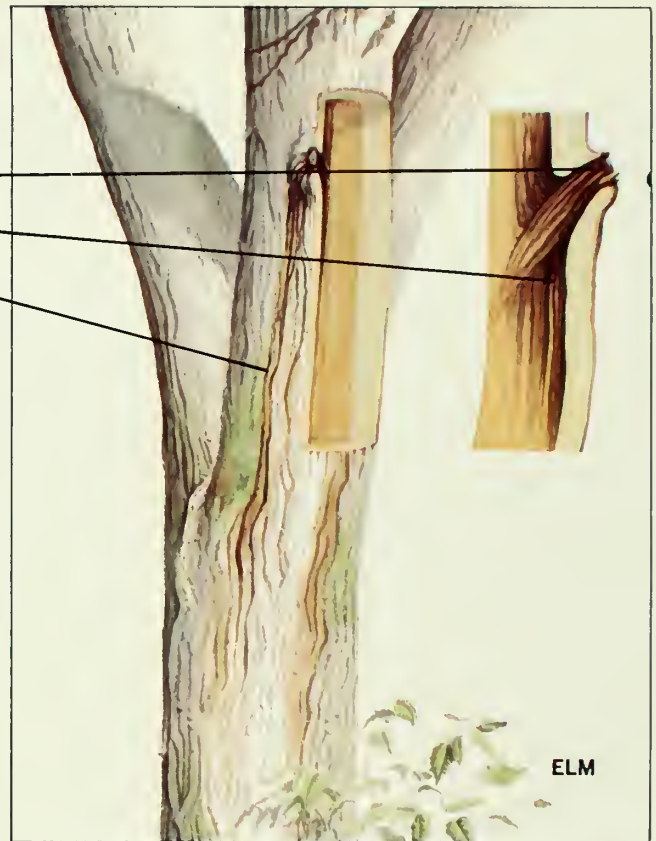
Improper



29. Proper pruning helps produce healthy, well-formed trees.

30. Slime flux bacteria often infect old, poorly healed stubs.

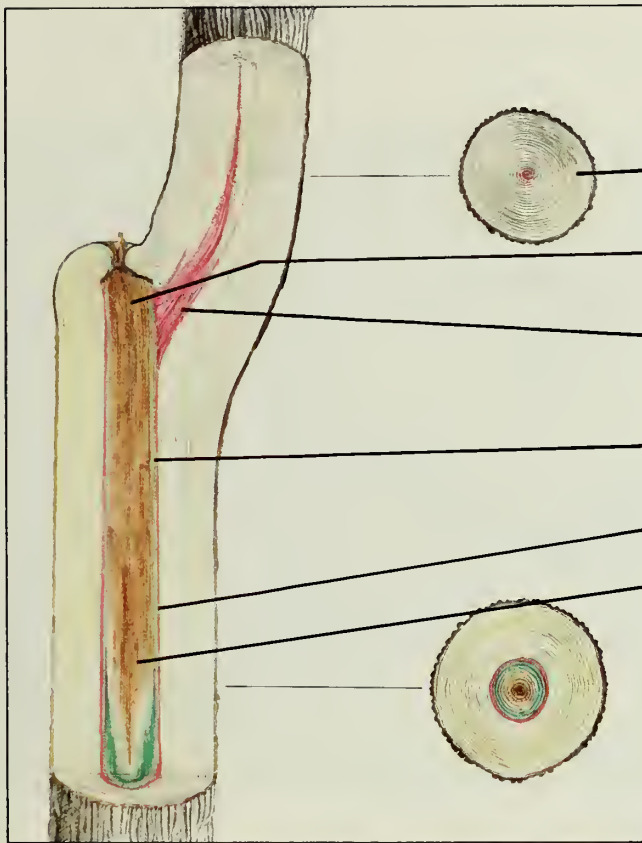
Poorly healed branch stub
Wood infected with bacteria
Bacterial ooze



31. Broken top

Vigorous branch
Broken main stem
Poorly healed stubs





32. Decay in stem stub
New leader is free
from decay.

No decay in new leader

Decay confined to old
leader

Red—host response to
wounding

Decay compartmentalized
in wood present when the
top broke off

Green—pioneer
microorganisms

Brown—decay

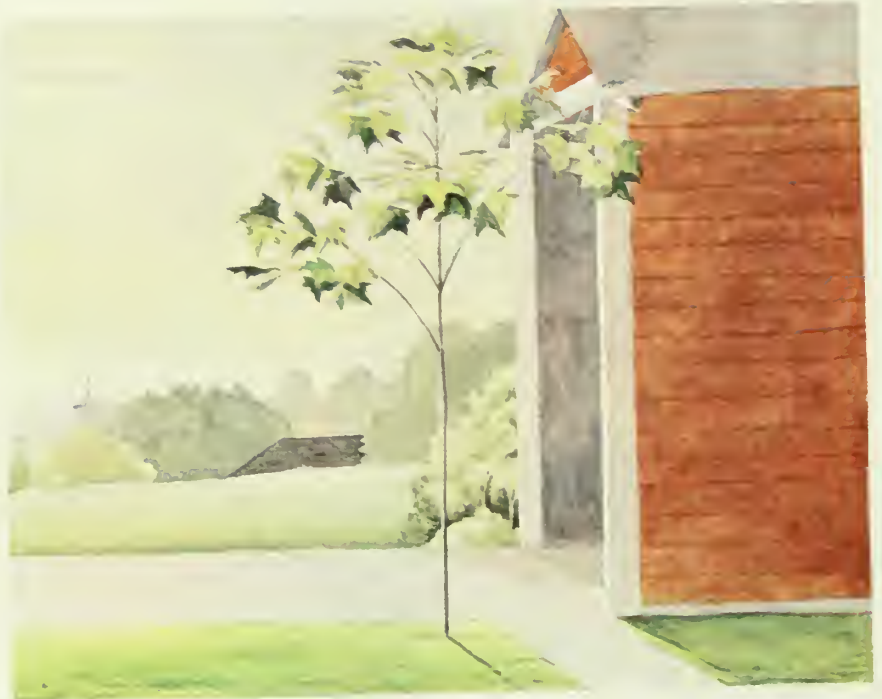


33. Branch as new leader

Branch as new leader

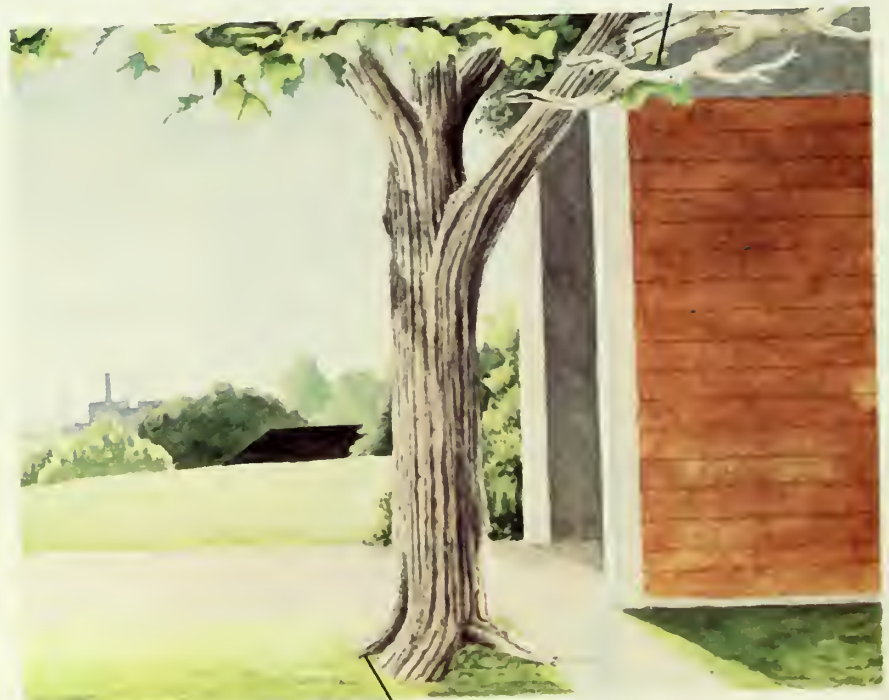
Well-healed old stem stub

Well-healed branch stubs



34. Young branch in collision course with a building

Large dead branches



35. Broken branch and injured roots 50 years later

Wounded base and broken roots

Trees that bear flowers or fruit abundantly should be pruned with extra care as they develop. The tree shape that looks beautiful when the tree is young could spell disaster later on. This is especially true when young trees are released from the forest during house construction. When trees selected to remain in a new lawn are fertilized heavily or when the surrounding lawn is fertilized, low branches continue to grow. Although this may look fine for a while, it can be the start of trouble, since low, heavy branches often split during storms. (See illustrations 36, 37, 38, and 39)

Proper care for trees with low, heavy branches should be undertaken while they are still young.

With improper care, trees with low, heavy branches are bound for disaster. (See illustrations 40 and 41)

Prune dead and dying sprouts from clumps. Select for dominant sprouts those that have well-healed branch stubs. (See illustrations 42, 43, 44, and 45)

Plan ahead to avoid wounds when planting trees in a yard. By planning ahead, it should be possible to plant a tree in a place where it will not receive wounds or require harsh pruning later on. Avoid planting trees in the paths of both present and potential wounding agents. (See illustrations 46 and 47)

Plan ahead to avoid wounds when converting forest trees into yard trees. Select only the most vigorous trees to remain. First, consider the condition of the branch stubs. Are they well-healed or not? Look for early signs of other troubles, such as poorly healed wounds and cankers. And when you do select some trees to remain, don't put a path of trouble—like sidewalks, driveways, and doghouses—near them. Remember that small wounds, although not serious now, can become disastrous as they accumulate over the years. (See illustrations 48, 49, 50 and 51)



36. Prune away any low, heavy branches or low forks that might form.



37, 38, 39. Proper care for trees with low, heavy branches should be undertaken while they are still young.





40, 41. With improper care, trees with low, heavy branches are bound for disaster.



Old stump with basal
sprouts



42. Many sprouts from a recently cut tree

Poorly healed branch stubs
on many sprouts



43. Dominant sprouts develop quickly and usually form low on the cut stump.



Vigorous sprout—
well-healed stubs

Most sprouts very
defective

44. All weak and diseased sprouts should be cut, especially those that form high on the stump.



45. Given this care, well-formed vigorous trees will result. Basal decay from cut sprouts is seldom a problem when low-forming sprouts with well-healed branch stubs are left to grow.



46. Beautiful today



Broken branch
Dying branch
Severe basal wounds

47. Unsightly and hazardous tomorrow



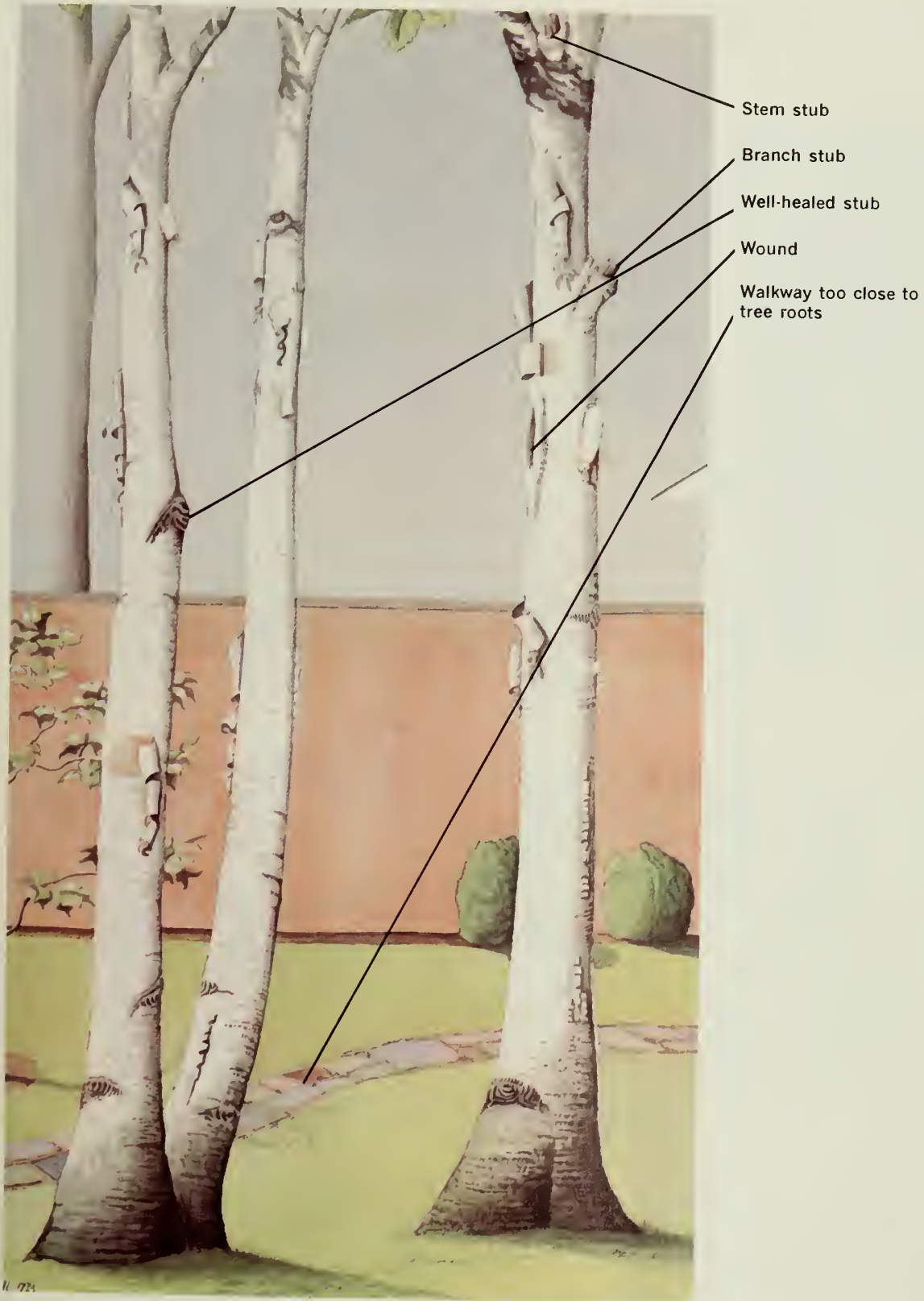
48. Beautiful today



49. A problem tomorrow



50. Forest tree today . . . The forest tree is competing with many other trees. Branch stubs are common in forest trees.



51. Front yard tree tomorrow . . . Root injuries and basal injuries may occur because of a close walkway.

HOW TO TREAT WOUNDS

Try to prevent wounds first, but when a tree is wounded, take these steps:

1. Remove dead and injured bark from around the wound with a sharp knife. Scribe wound in the shape of a vertical ellipse, if possible. Cut bark away from wound to form an interface of healthy wood and bark, although this may enlarge the size of the wound.
2. Prune dead and dying branches to increase tree vigor.
3. Remove dead and fallen branches and trunks from the ground nearby. Such dead wood may harbor wood-inhabiting microorganisms that could infect wounds.
4. Thin out and remove less valuable trees nearby to reduce competition for nourishment in favor of the wounded tree.
5. Fertilize and water the tree properly to increase vigor.
6. Discuss the wounded tree with professionals. Establish a maintenance program.
7. Apply some wound dressing, if desired.

(See illustrations 52, 53, 54, and 55)



52. Loose injured bark around wound

Scribe wound properly

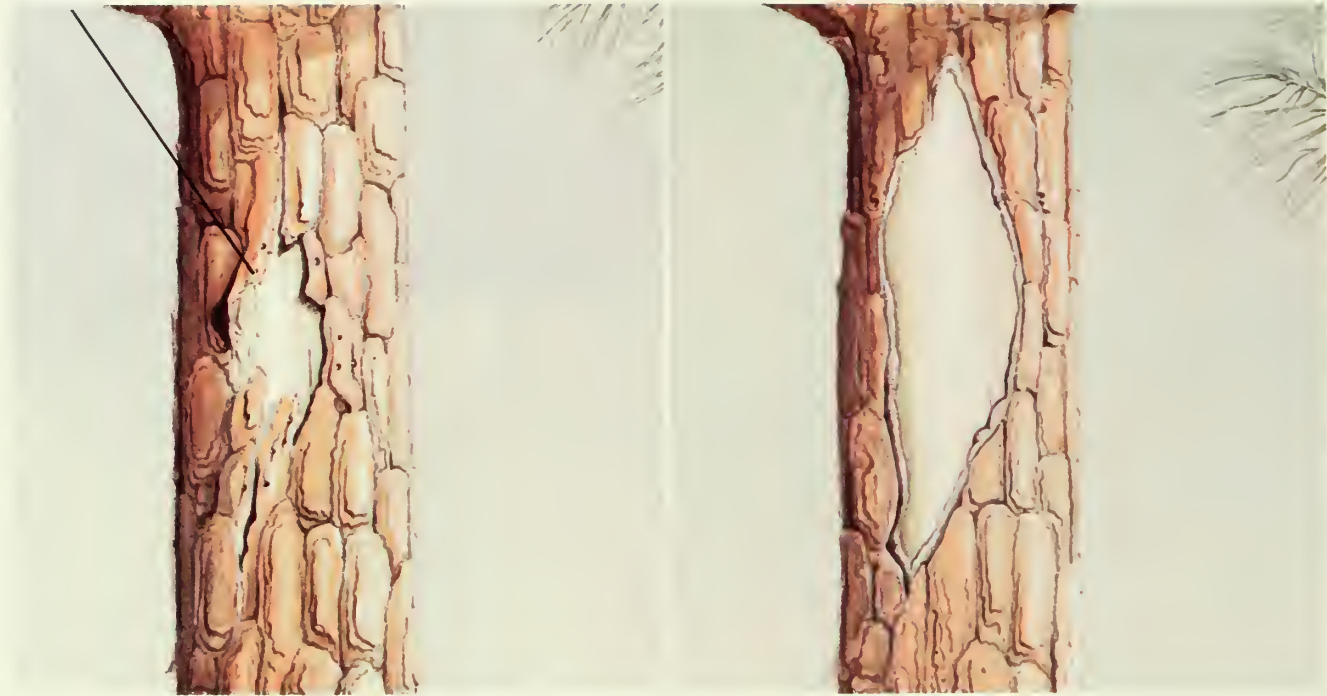


53. Wound after injury. Dead bark not removed

Wound 1 year later.

Wound dressing alone does little to stop decay.

Insect holes indicate
dead bark



54. Remove bark covering old wounds. Insects and microorganisms grow rapidly under old, dead bark. Old wounds that have formed a callused ridge should not be scribed.



55. Splits often develop above and below poorly treated wounds.

Rx FOR WOUNDED TREES

Follow this prescription for preventing or minimizing the damage caused by decay.

Prepare:

Learn about trees. The booklets in this series are designed to help prepare you to care for your trees properly.

Plan:

Plant trees according to a carefully thought-out plan. Do not plant trees in the paths of either present or potential wounding agents. Do not plant trees close to driveways, walkways, streets, patios, or houses.

Protect:

Protect trees from wounding. Give your trees proper protection, especially during construction jobs.

Prevent:

Prevent the development of decay following wounding. Treat wounds properly to help trees heal themselves faster. Establish a regular checkup program to keep healthy trees in good condition and to improve the health of sick or wounded trees.

Prune:

Prune trees as necessary. Prune dead and dying branches. Also remove suppressed sprouts, hazardous trees, and low value trees that may crowd the valuable injured tree.

Provide:

Provide fertilizer, water, and constant care. All are important elements in maintaining trees and/or increasing tree vigor.

Professionals:

Seek help. A qualified professional tree expert should be consulted about major tree jobs.

And, remember, SAFETY FIRST! Know your limits with tools and the job that must be done. Working with and around trees can be dangerous!

A hollow can result when decay associated with old wounds continues to develop over a long period of time. A hollow forms because the wood that develops after the tree is wounded is usually not decayed. (See illustrations 56, 57, 58, and 59)

Tree hollows can be filled with a variety of materials. Although it is very doubtful that this cavity filling will STOP the decay process, it can help to strengthen the trunk and provide a base for the developing callus around the wound. Cavity fillings are sometimes also desirable for esthetic reasons. When filling in a hollow, be very careful not to injure the tough compartment wall that separates the hollow and decay from the healthy wood. (See illustrations 60, 61, 62, and 63)

Sanitation is extremely important. The microorganisms that may infect wounds often live on dead wood scattered on the ground. Keep dead wood away from healthy trees. (See illustrations 64, 65, 66, and 67)

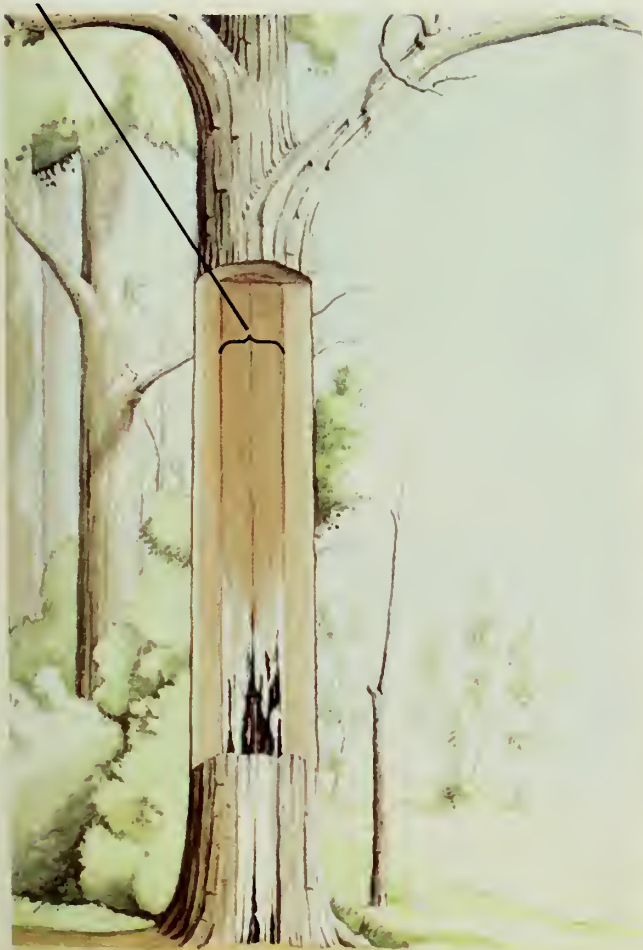


56. Tree wounded by fire



57. Tree after fire

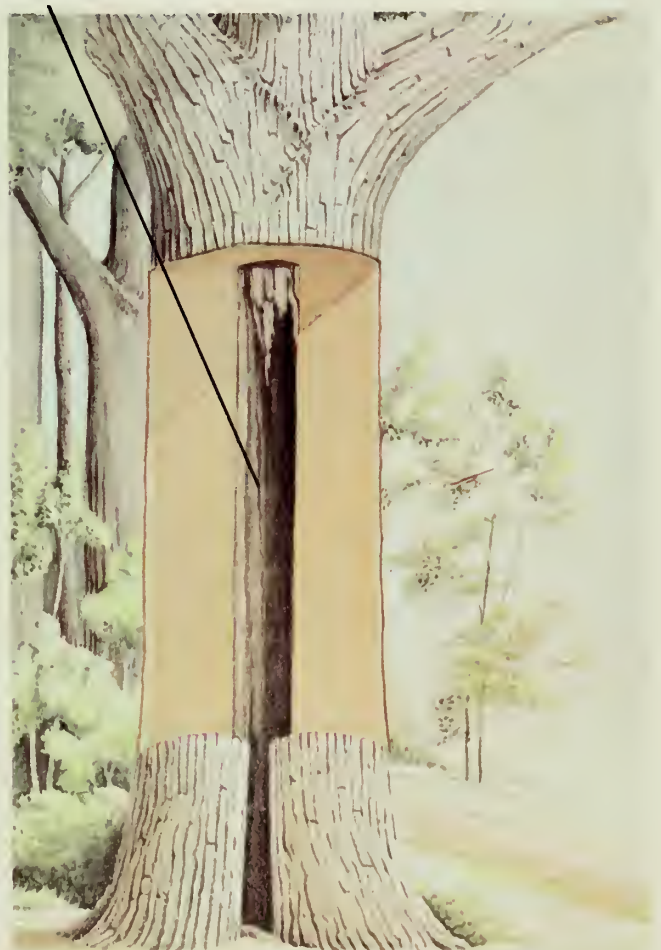
Wood present when base
was burned



58. Wood that forms after the tree is wounded is not infected.

COMPARTMENTALIZATION

—Hollow is diameter of
tree when it was burned.



59. When wood-inhabiting microorganisms digest all the wood in the compartment, a hollow results. Hollows start with wounds.

Hollow and decay
associated with old
basal wound



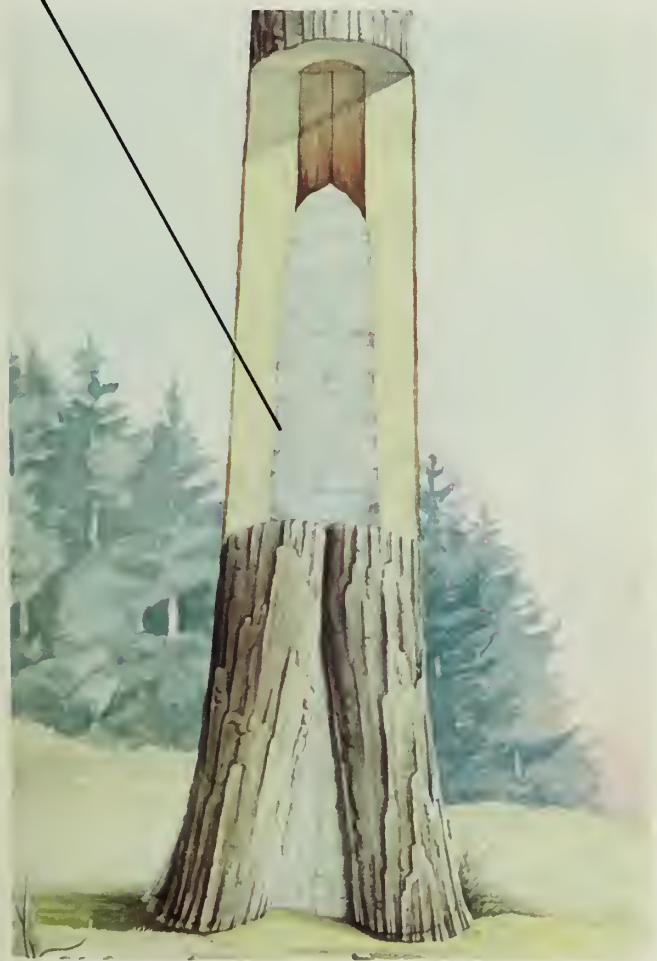
60. Hollow in tree

Cavity filling material well
inside wall between decay
and clear wood



61. Properly filled hollow. Decay will stay within the compartment.

Cavity filling material
beyond compartment wall



62. Improperly filled
hollow

New decay starting to set
in where the wall was
broken



63. Decay can now develop beyond the compartment
wall to weaken the tree.



64. Sanitation needed



65. After proper sanitation

Many large dead
branches

Branch stub and
open seam

Old basal wound



66. Before sanitation
treatment

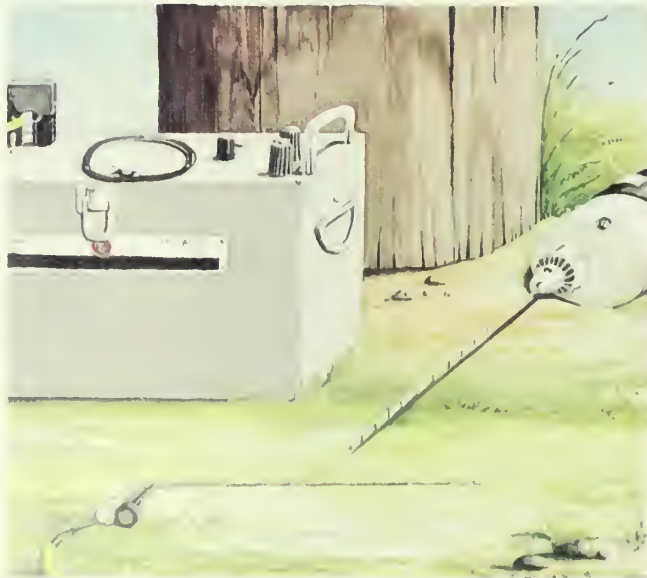


67. After sanitation treatment, this tree has a good
chance to develop as a high-quality, healthy
specimen.

THE SHIGOMETER—A DEVICE FOR DETECTION OF DECAY

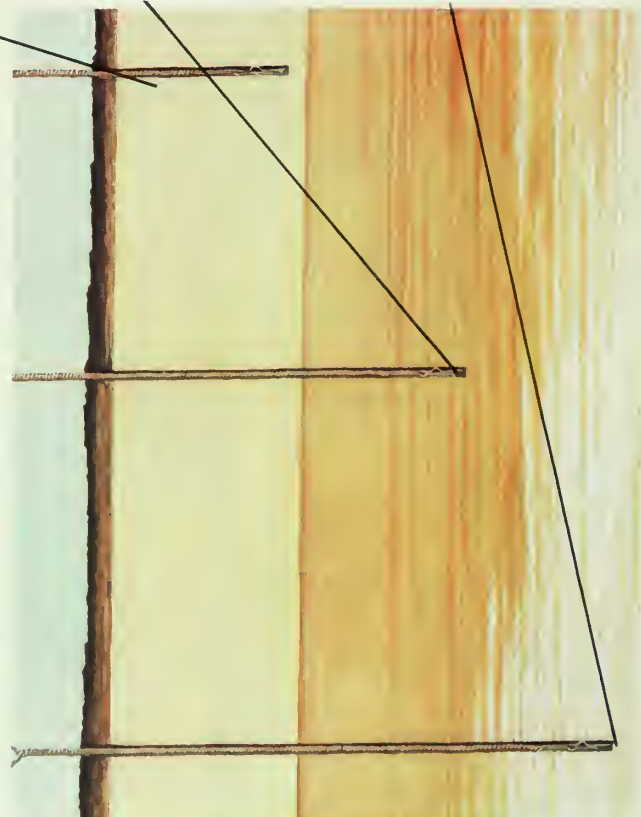
Decay in trees can now be detected accurately with a new device called a SHIGOMETER. A hole $\frac{3}{32}$ inch (2.38 mm) in diameter is first drilled into the tree with a portable battery-operated drill. This hole can be drilled to a depth of 12 inches (30.48 cm) in less than a minute.

Results of experiments indicate that a tree can heal such a small wound very quickly. A long, thin probe is next inserted into this hole to indicate the condition of the wood at the tip of the probe—especially whether decay is present or not. (See illustrations 68, and 69)



68. The Shigometer—drill and probe for detecting decay in living trees

Sound clear wood—high reading Discolored wood—drop in resistance reading Decayed wood—very low readings



69. Probe entering discolored and decayed wood in a living tree.

HELP YOUR TREES

Unightly and hazardous trees don't just happen. They are the result of improper care or neglect.

If a tree is free from decay, then a regular maintenance program should be established to keep it

healthy. If the tree is badly decayed, it should be removed by professionals. If the tree has some decay, but not enough to present a hazard, then a strong program to increase its vigor should be started at once.

To help your trees retain their value and their beauty, establish a regular tree-care program. Learn the early signs and symptoms that could lead to trouble. (See illustrations 70 and 71)

REMEMBER THE 7 P'S!

PREPARE

PREVENT

PRUNE

PROFESSIONALS

PLAN

PROTECT

PROVIDE

They are your Rx for tree wounds

Large dead branches over house



Fruit body of decay fungus



70, 71. Examine trees regularly for dying branches and for fruit bodies of decay fungi.



Woody Says:

TREES ARE FOR OUR USE — NOT ABUSE.

FEBRUARY 1976