S. DEPARTMENT OF AGRICULTURE
Forest Service

FOREST PEST LEAFLET 30
October 1958

Heart Rots of Incense-Cedar

By Willis W. Wagener and Robert V. Bega, forest pathologists, California Forest and Range Experiment Station [1]

Incense-cedar (*Libocedrus decurrens* Torr.), a common component of mixed-conifer timber stands in California and southern Oregon, is subject to heavy cull from heart rot, and almost all of the cull is from pocket dry rot caused by the fungus *Polyporus amarus* Hedgc. In California over 36 percent of the volume of standing incense-cedar is cull from this source.

This cull represents a waste of more than 5 billion board-feet of timber. Loggers must leave a great many trees containing pocket dry rot in the woods as complete culls; from other trees they salvage only a log or two. Some lumber containing only scattered pockets of dry rot is utilized for rustic effect, but this use is of little significance in reducing overall cull losses. Most of the affected wood used in low grade construction fails to return production costs.

Pocket Dry Rot

Occurrence.—Pocket dry rot is found throughout the range of incense-cedar and is confined solely to that species. It is most prevalent where site conditions for growth of the host are good and least common near the eastern limits of incense-cedar. Here moisture and temperature conditions are less favorable for establishment of the fungus than in the milder parts of the range to the west. For comparable age classes of incense-cedar, cull in the eastern part of its range may be as little as one-fourth that in western stands. In representative numbers of trees the volume of affected wood increases with tree age. Trees under 150 years old are relatively free of decay. After 200 years of age, decay increases rapidly and in old, overmature trees results in average cull of two-thirds of total volume.

The fungus enters the tree chiefly through open fire wounds and large open knots or stubs of large broken branches. Trees with such openings are particularly liable to infection when growing in ravines or other locations favoring the retention of surface moisture on exposed

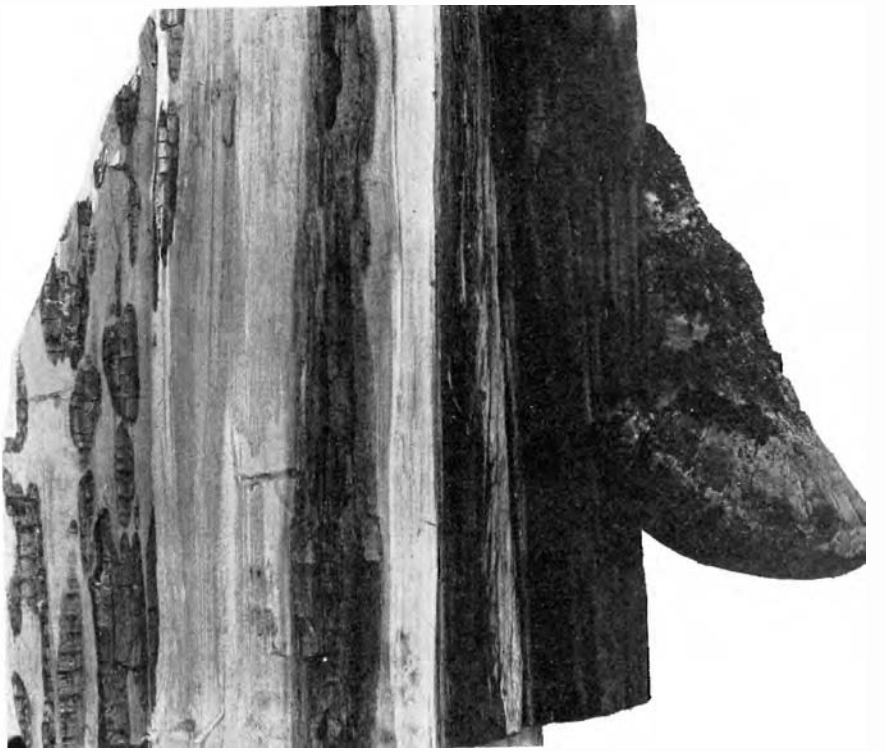
[1] Maintained at Berkeley, Calif., by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of California.

466606°—58

heartwood. Infection apparently takes place from wind-disseminated spores of the causal fungus.

Description of rot.—In the early or incipient stage pocket dry rot appears as a faint yellowish-brown discoloration of the heartwood. As the discoloration deepens, elongated pockets with rounded or pointed ends develop (fig. 1). These are ordinarily several times longer than broad, varying in length from half an inch to approximately a foot, and are irregularly rounded in cross section. Within the pockets the wood is broken down into a dark brow friable residue, traversed by cross or longitudinal shrinkage cracks. In these cracks or over the surface of the brown decay, films or thin felts of whitish mycelium are present in some of the pockets. The edges of the pockets are very sharp, without any zone of gradation from pronounced decay to the normal sound wood between pockets.

Pockets are confined to the heartwood of the main trunk or the bases of the large limbs. Initial pockets in an advancing column of decay



F-485914

Figure 1.—A block from an incense-cedar trunk attacked by pocket dry rot. Longitudinal view showing typical decay pockets of the fungus in the inner heartwood and an old conk attached to the outside bark.

e sometimes small and scattered and may be confined to only a part of the heartwood cylinder. As the decay intensifies, the pockets become more numerous and sometimes grow together or nearly so. Pockets seldom form in exposed heartwood and are sparse near large open wounds but often become numerous within a foot or two above them. Therefore inspection of the face of an open wound affords no clue as to whether or not the tree contains pocket dry rot. Similarly, pockets are developed to only a limited extent in the butt of the tree. Because of this the condition of the heartwood at the stump cut of a felled incense-cedar does not provide a good index of the presence of pocket dry rot higher in the trunk. Near old healed wounds, broad pockets several feet long sometimes develop but are not found elsewhere.

Decay indicators.—There are only two positive indicators of the presence of pocket dry rot within a tree: conks (fruit-bodies) and shot-hole cups. Neither is common.

The conks (fig. 2), which produce the microscopic spores by which the fungus is spread, form on the bark at an open knot, usually at 15 to 30 feet from the ground, and grow rapidly to full size. Most of them appear between July and September but occasionally in other months.

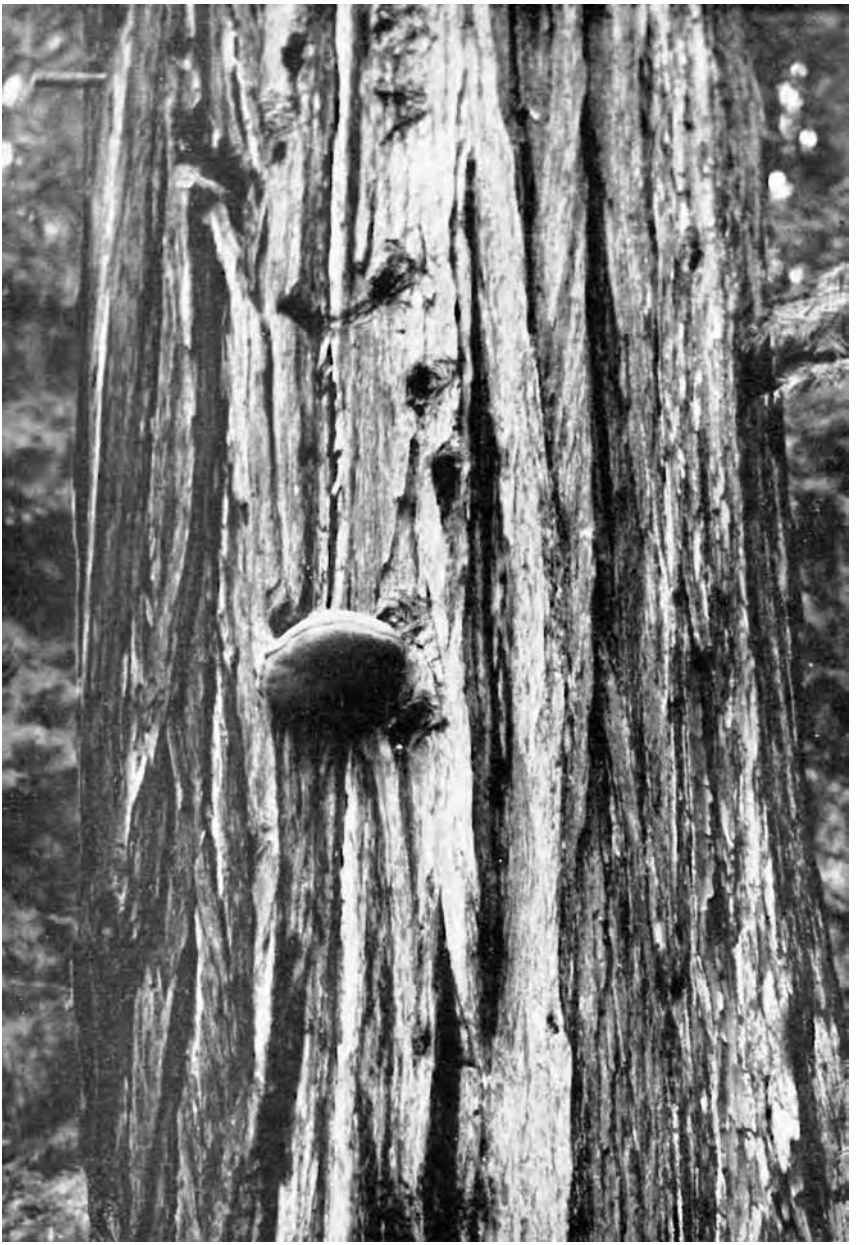
Conks are half bell shaped or somewhat hoof shaped in form and when mature average 4 to 8 inches wide. The color is at first buff to tan on top and a bright sulfur-yellow underneath, darkening in age to an overall chalky tan. Fresh conks are soft and moist; older ones, firm and dry. The layer of angular tubes within which the spores are produced develops on the under side of the conks.

Spore production begins shortly after the tubes are formed and continues as long as the conk remains vegetatively active, usually not longer than 6 to 10 weeks. Very soon after the conks appear, insect larvae begin to mine through the interior. Ordinarily the larvae destroy a conk within a few months.

Before destruction is complete, the larvae present escape into the bark behind the conk, producing in it numerous small open borings or shot-holes. Here they are sought by woodpeckers, which chip away the bark to form depressions known as shot-hole cups (fig. 3). This remains as a permanent marker of the site of a former conk.

The pocket dry-rot fungus does not form fruit-bodies until a large volume of decay is present in a tree and then not every year. As a rule, only one conk is produced at a time on a tree; rarely, two.

Trees bearing either conks or shot-hole cups are certain to contain extensive pocket rot, which renders them unmerchantable. But these indicators can be found on only a small proportion of the old trees in a stand. Old trees without conks or shot-hole cups but with large open fire wounds are very likely to contain rather extensive pocket dry rot, except near the eastern range limits for incense-



F-485915

Figure 2.—A conk of the pocket dry rot fungus on the trunk of a living incense-cedar. It denotes extensive pocket dry rot in the heartwood.

F-485916

Figure 3.—A shot-hole cup on the bark of an incense-cedar, marking the location of a former conk of the pocket dry rot fungus.

cedar. There fire wounds cease to be significant as indicators of the probable presence of decay.

Many incense-cedars contain extensive pocket dry rot but do not show specific external indicators of its presence. Other trees of similar appearance are entirely sound. For these reasons timber cruisers cannot determine the amount of cull satisfactorily by indicators alone. Where available, however, flat deduction factors for cull, worked out and applied by tree classes, give reasonably good net cruise volumes for the species.

Other Decays

Decays from several other fungi are occasionally found in incense-cedar heartwood but result in very little additional loss of usable wood. Usually they occur in trees in which pocket dry rot is also present.

One of these decays is red ring rot, sometimes called "white speck," caused by the fungus *Fomes pini* (Thore ex Fr.) Karst. Affected wood is darker than normal and is pitted with small, closely spaced oblong or spindle-shaped pockets, either empty or partially filled with loose, whitish cellulose fibers. Conk production on incense-cedar by this fungus is so rare that only a few have ever been found. In the northern part of the range of incense-cedar, occasional trees are found in which red ring rot is the only decay present in the heartwood. Then the rot may be responsible for considerable cull in individual trees although the amount is scarcely significant for the stan as a whole.

A brown butt rot, thought to be caused by the velvet-top fungus, *Polyporus schweinitzii* Fr., is sometimes found in incense-cedar, but the rot seldom extends for more than a few feet above stump height. Affected wood is broken down into a dark brown friable decay separated by shrinkage cracks into large rectangular chunks. This rot occurs in a large single mass instead of in pockets. The rot is so infrequent and extension into the trunk above stump height is so limited that the cull caused is minor. Limited infections by several other undetermined rots are sometimes found back of old open fire wounds but do not cause appreciable loss of wood.

Minimizing Future Losses

Preventing fire wounds through the control of ground fires and felling incense-cedars likely to produce conks will go far in reducing pock dry rot in future stands of the species. Both measures are now commonly practiced. Also, it is probable that incense-cedar in future stands will be cut at a much earlier age than the average for the virgin trees now being harvested. Accordingly, heart rot should not be a serious problem in future managed stands.

Use of Affected Wood

Neither the pocket dry rot fungus nor the red ring rot fungus remains active after heartwood containing either of them has been converted into lumber or split products.

herefore wood with these decays is safe to use if it meets the strength or other requirements for the particular job. For example, if a fence post with occasional dry rot pockets is placed in service, there will be no danger of further progress of the pocket dry rot. If decay occurs, it will be from other fungi that commonly attack posts.

References

THE DRY ROT OF INCENSE CEDAR. J. S. Boyce. U. S. Dept. Agr. Bul. 871, 58 pp., illus. 1920.

DECAY IN PACIFIC NORTHWEST CONIFERS. J. S. Boyce. Yale Univ., Osborn Bot. Lab. Bul. 1, 51 pp., illus. 1930.

CULL AND BREAKAGE FACTORS FOR PINES AND INCENSE-CEDAR IN THE SIERRA NEVADA. James. W. Kimmey. U. S. Forest Serv. Calif. Forest and Range Expt. Sta. For. Res. Note 90, 4 pp. 1954.

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 5 cents

Pesticide-Information Disclaimer

This page has been added; it is not part of the original publication.

****

This USDA Forest Service *Forest Pest Leaflet* (FPL) or *Forest Insect & Disease Leaflet* (FIDL) - both representing the same publication series - has been reproduced in whole from the original publication as a service of the Montana Department of Natural Resources and Conservation (DNRC) Forest Pest Management program. Both FPLs and FIDLs contain useful and pertinent information on forest insect and disease biology, identification, life cycles, hosts, distribution, and potential management options.

Some FPLs and FIDLs, however, discuss and (or) recommend pesticides that are no longer registered with the U.S. Environmental Protection Agency or are no longer available for use by the general public. Use of these pesticides is neither recommended nor endorsed by the Montana DNRC.

Before using any pesticide be sure to consult either a forest health specialist; state extension agent; your state's Departments of Agriculture, Natural Resources, or Forestry; or other qualified professional or agency with any questions on current pesticide recommendations for forest insects and diseases.