Fifty Years Progress in Managing Ponderosa Pine in the Pacific Northwest

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FOR fifty years ponderosa pine has experienced a unique spot in American forestry. It has not suffered the severe depredations of its Eastern pine cousins. By the time the westward march of lumbering had reached the vast stands of western yellow pine serious thought, as well as action was being advanced by foresters in public and private service alike.

Because of existing tax structures covering timber lands fifty years ago, the usual logging practice was to remove all the merchantable volume on an area. If the land was to be retained by the owner, regeneration and a future cut was left in the hands of nature. In many instances the cut-over land was converted to agricultural purposes. This proved to be a serious error on much marginal land in the lake states; and the lesson learned by timber owners aided the advancement of western forest management.

At the turn of the century forest practices in ponderosa pine were not good; to say they were, would be inconsistent with the efforts and advancements made for foresters for two generations. From 1900 to 1925 the majority of operators removed practically all merchantable trees; the operations were small and horses were generally employed in skidding. Because of the nature of the pine forests small trees were left intact and capable of increased growth. These areas that escaped denudation from slash fires now support excellent stands of reproduction and poles.

Some action was being given fire protection and steps to organize a protective association were taken in 1908. However "light burning" was sometimes practiced in the virgin forests with the theory in mind that this was desirable fire prevention. Subsequent growth of grass and brush made continued burning necessary, which in turn caused soil deterioration, death to reproduction, fire scars, and continued aggravation of existing fire scars. On some areas which did not escape the ravages of slash burning the fires killed all the reproduction and brush and grass have taken over.

Fire control gradually improved until now a great deal of money and effort is expended annually by the land owner in pro-

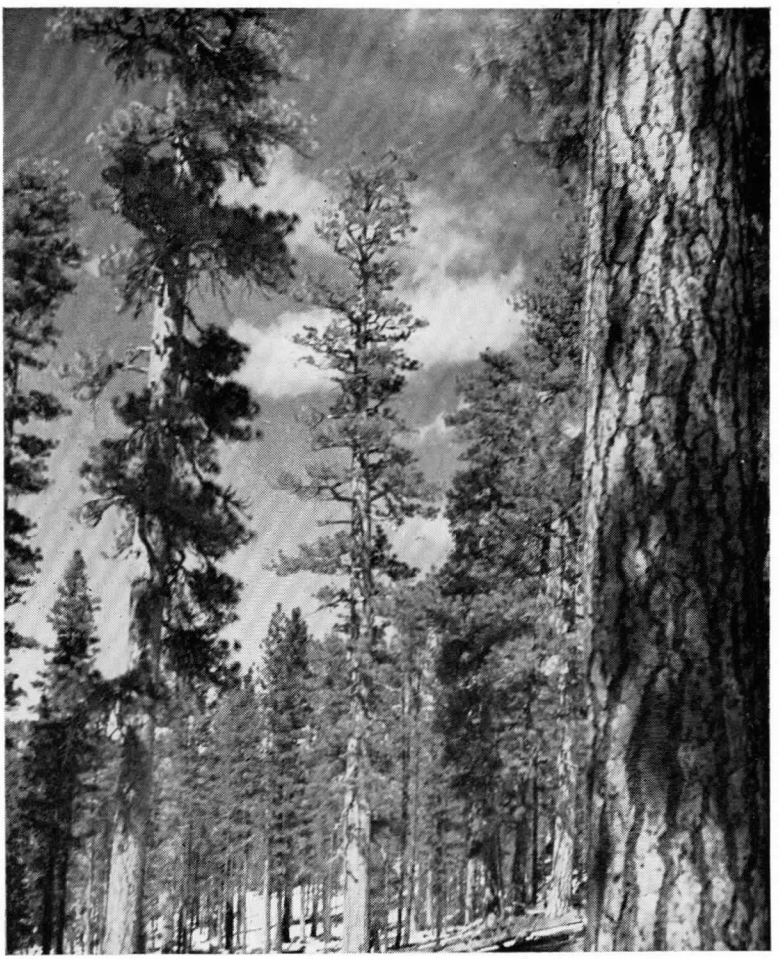
A reserve stand of ponderosa pine after the main harvest. The tree at left and the one right of center will be removed 40 years hence. Trees in the background will make up the second and third cuts 80 and 120 years hence.

tecting the future timber supply. Although compulsory laws now require slash burning, new methods control the fires and hold the damage to the reserve stand at a minimum. At first "broadcast burning" was carried on exclusively. This caused too much damage to reproduction when weather conditions were not right. Hand piling of slash was then instituted. This obtained the desired results but proved to be expensive and time consuming. With increasing mechanization of woods operations the mechanical slash piler has come into the picture. This makes it possible to move slash as well as cull logs and other debris into large piles

which can be burned without damage to the reserve stand. It also has some scarifying effect on the ground; thus preparing it for natural regeneration.

The manager of ponderosa pine in the Pacific Northwest has from necessity changed his methods of handling virgin stands. In attempting to change a wild forest, which is static in growth, to a managed forest capable of producing maximum yield, the forester now bases his actions on the behavior of the western pine beetle. Ecological and economic factors still enter the picture, but are worked into the plan of operation.

The western pine beetle is a native of the ponderosa pine



The large class 4B tree (center) is a typical cut. Notice the thrifty stand of poles in the background.

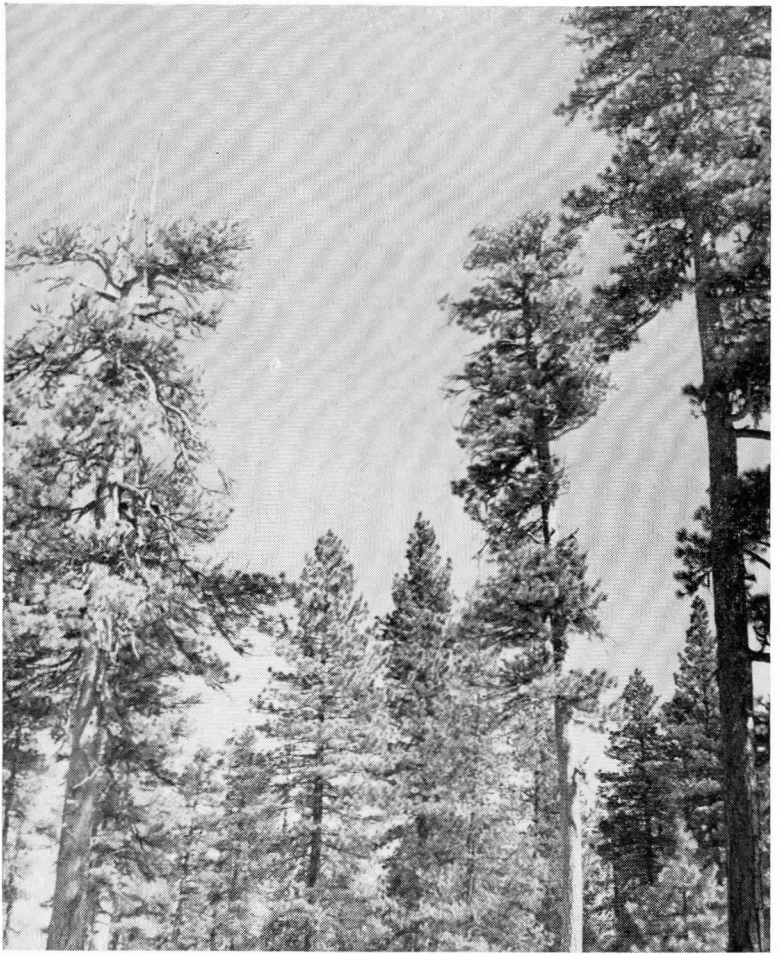
region. He has been killing overmature, decadent, and weakened pines for centuries, but only within the last 50 years or so was the western pine beetle recognized as a primary tree killer. It was not until about 1917 that his destructiveness was appreciated. Along about this time a prolonged series of drought years began causing a marked decline in tree growth. With this weakening of tree vigor, western pine beetle destruction mounted rapidly and timber owners began to recognize this tiny killer as a serious menace to their property.

Originally attempts were made to selectively log pine stands on an economic basis. Only those trees that the operator felt would pay their way were removed. This process left a reserve stand, but it contained a high proportion of what we now know to be risk trees. These are the less vigorous trees capable of supporting broods of the western pine beetle. A western pine beetle attacking one of these susceptible, or risk, trees is capable of producing about nine adults for each attacking adult. It takes little imagination to realize what such an influx of bark beetles can do to the remaining stand. In contrast to this the insect production is almost in reverse ratio to the above when the bark beetle attacks a vigorous tree.

The Bureau of Entomology and Plant Quarantine has done an excellent job in ferreting out the behavior of the bark beetle, and methods of control were established on the basis of their findings. This developed into a large scale operation after a peak epidemic in 1932. "Bug crews" were used in this work. The object of these crews was to fall and peel all brood trees, which were then burned. No attempt was made to salvage the trees. This reduced the loss temporarily, but did not remove the weak or risk trees. As a result the bark beetle was able to continue its depredations.

With this situation confronting foresters attempting to put wild forests under management, the logical approach was to remove all infected trees as well as those highly susceptible to insect attack. By so doing the land owner would also realize a return on the material removed. The problem then arose—how can a susceptible, or risk tree, be distinguished from one not susceptible? F. P. Keen of the Bureau of Entomology and Plant Quarantine was instrumental in solving this problem. He devised a tree crown classification using Dunning's seven classes as a basis. As a result of Keen's studies* and work we now have a tree classification based on four categories for age and four on crown vigor. With these refinements it is possible to identify the trees by classes

*Keen, F. P. 1936 Relative Susceptibility of ponderosa pine to bark beetle attack. Journal of Forestry 34:919-927.



The large 4C (left) and the 4B (right) are removed in a harvest cut. In a salvage cut designed to protect the stand for a relatively short period, the 4C is cut while the 4B is retained for a future harvest.

and select those most vulnerable to insect attack in marking a particular stand.

In designing a cutting practice for a timber stand it is necessary that it fit the hazards of the timber. In ponderosa pine our major hazard is the *risk fraction.* The risk fraction is so called because 85 per cent of the loss will normally occur in this 15 per cent of the stand. The trees making up this group are the C and D crowns in Keen's classification. The remaining portion of the stand is broken into two categories. Sixty per cent of the stand contains the mature or the *stable fraction.* These may be crown

classes A, B, and C in the mature or age class III. In this group we find the current growth offsetting loss, and the individuals are relatively safe for storing for a future cut. The other 25 per cent of the average forest is the growing stock, and is retained for the harvest in the second or third cutting cycle. This group is the productive fraction of the stand.

Considering these three fractions of the stand we can draw up a cutting plan giving consideration to the economic and ecological factors involved. Suppose we have a tract of timber that must be developed for railroad logging as opposed to a truck haul. This naturally involves a large investment for development, and requires the maximum cut allowable to realize a return on this investment. By removing the risk fraction (15 per cent of the stand) and the stable fraction (60 per cent of the stand) we are able to satisfy both conditions. We have a fairly heavy cut, to offset the cost of development; and we can expect to earn a reasonable rate of interest on the amount invested in the reserve stand, which produces about 85 per cent of the maximum available growth. With this type cut our cutting cycle is set at 40 years. We will utilize all undesirable trees (small mature trees—Keen's classes 3D and 4D) insofar as they are merchantable. We will also remove high value trees that would be exposed to loss

A stand of thrifty mature ponderosa pine. The groups of reproduction in the background will be released for a future cut.

before a return cut is made. These conditions as well as those covering mechanical defects are incorporated in the marking rule.

We may next take into consideration an area lending itself to a lighter harvest. This would be one more accessible than the previous example; one suitable to truck development. Here we will develop a cut designed to a 20 year cycle. The marking rule again requires the removal of the 15 per cent risk fraction plus one half the stable fraction. This will leave the growing stock and the vigorous mature half of the stable fraction. The per cent return on the investment in reserve timber will be reduced to one half the return rate realized on the heavy cut, but the growth rate would rise to near maximum capacity. Other conditions involved in making such a cut feasible would be to accelerate conversion of a timber tract to a producing unit, and to secure reproduction where natural regeneration is a factor.

The third type cut, now becoming an increasingly important tool to the forest manager is the sanitation salvage. This is essentially a flexible light cut; the amount of timber removed from the stand may vary according to the character of the stand and the degree of protection desired. It is designed to cover large tracts of timber rapidly, removing the susceptible fraction of the stand, thereby recovering material that would normally be lost. The per cent cut can be geared to the period that will elapse between the salvage cut and the main harvest, which is the protective period. Any stands that will be reached within five years are not treated, except perhaps to remove merchantable dead trees. In a stand needing protection for ten or fifteen years a cut of 10 per cent will probably suffice.

This cut consists of the more susceptible trees in the 15 per cent of the stand we know as the risk fraction. Experience has shown that about 80 per cent of the loss which would occur in the next ten years will be prevented by this type cut. Similar cuts are designed, and marking rules established, for each area depending on the protective period desired. The actual removal of the material from these stands is done with relatively mobile equipment. Existing roads are used when possible to make the truck hauls, and development costs are kept at a minimum.

In summarizing fifty years of progress in ponderosa pine management in the Northwest the forester found the western pine beetle his most important factor of control. For over twenty five years pine beetles have depleted mature and overmature pine forests faster than the forests have grown. As a result the harvesting of ponderosa pine has developed into a race between the beetles and the land owner in an attempt to convert the forests

into manageable units. After attempting control methods which were costly and provided no yield to the land owner, the trend has been toward lighter cuts in an attempt to beat the beetles at their own game. New techniques and equipment for logging have and will in the future give the land owner a decided advantage.

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1. Graduated from I.S.C.—1940
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3. Forester for Weyerhaeuser Timber Company, Klamath Falls Branch—1942-1949
4. Secretary-Treasurer, Shasta-Cascade Chapter Society of American Foresters—1946-1948
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