Range & Pasture
Dryland - General

PRESCRIBED BURNING FOR FIRE HAZARD REDUCTION IN PONDEROSA PINE

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My particular contribution on the panel is concerned with research and demonstration on prescribed burning for fire hazard reduction in ponderosa pine. This is also referred to sometimes as light burning, and other times as controlled burning. This work has been carried on for the past eleven years at Hobergs in the North Coast range and on the Teaford Forest in the Sierra Nevada near North Fork. In this discussion I shall attempt to say where such burning should be done on the basis of available information, for what purpose, when, by whom, and how.

During the eleven year period actual burning was done each year except for the past season when I was in Europe on sabbatical leave. The prescribed burning in ponderosa pine has been carried out in two steps; (1) broadcast burning followed by (2) cleanup burning. The first step, broadcast burning, is an essential and required part of prescribed burning but the second step is not. Many thanks are due Dr. Schultz, Professor Jenny, Professor Sweeney, Dr. Vlamis, Mr. Struble, Mr. Crippin, and many others who have contributed to the research on this project.

Broadcast burning is done by raking a trail and igniting the pine needles on the edge. This operation is carried out only in the wet season after enough rain has fallen to wet the duff to the mineral soil. Such burning is stopped in the spring, or at other times, when the soil becomes a little dry. After rain the top needles dry in a day or two and they burn readily, but the lower ones dry slowly. This allows for

many days when broadcast burning is possible. Testing has shown that broadcast burning in the wet season is best done when the relative humidity is 25 percent or above and the air temperature is below 65° Fahrenheit.

In heavy accumulations of debris, the higher humidities and lower temperatures are desirable. After one broadcast burn, or two of them in successive years, the fires can be set under drier conditions. Best results are obtained by burning downhill, always starting at the top and working down. A fire that will burn gently downhill may burn out of control if permitted to burn uphill. A broadcast burn, or perhaps two of them, removes much of the flash fuel, old logs, and stumps on the ground.

Cleanup burning, the second step, consists of piling and burning dead brush, slash, and dead fallen trees after an area has had a broadcast burn. A fire is started and dead material gradually piled up as it burns. A good worker can keep a half dozen piles going at one time, and bulldozers can be used to good advantage. This kind of burning can be done under a wider range of weather conditions than broadcast burning because the fire hazard has already been reduced, also, techniques have been developed for starting fires under wet conditions, even in light rain. Generally, the cleanup burning should not be done without first making the broadcast burn; otherwise, the escape danger is great.

After an area has been broadcast burned and cleaned, the falling pine needles can then drop on the ground rather than draping themselves over the dead brush; consequently, the fire hazard builds back slowly and the benefits from burning can last for many years. Cleanup burning is the more costly of the two steps, but where the cost is divided by the years of benefit the operation appears to be very cheap indeed.

Broadcast burning is a job where good judgment, training, patience, and experience are invaluable. However, a university graduate is not needed for this kind of work. On the other hand, cleanup burning is largely a matter of labor and it does not require as much skill as the first step.

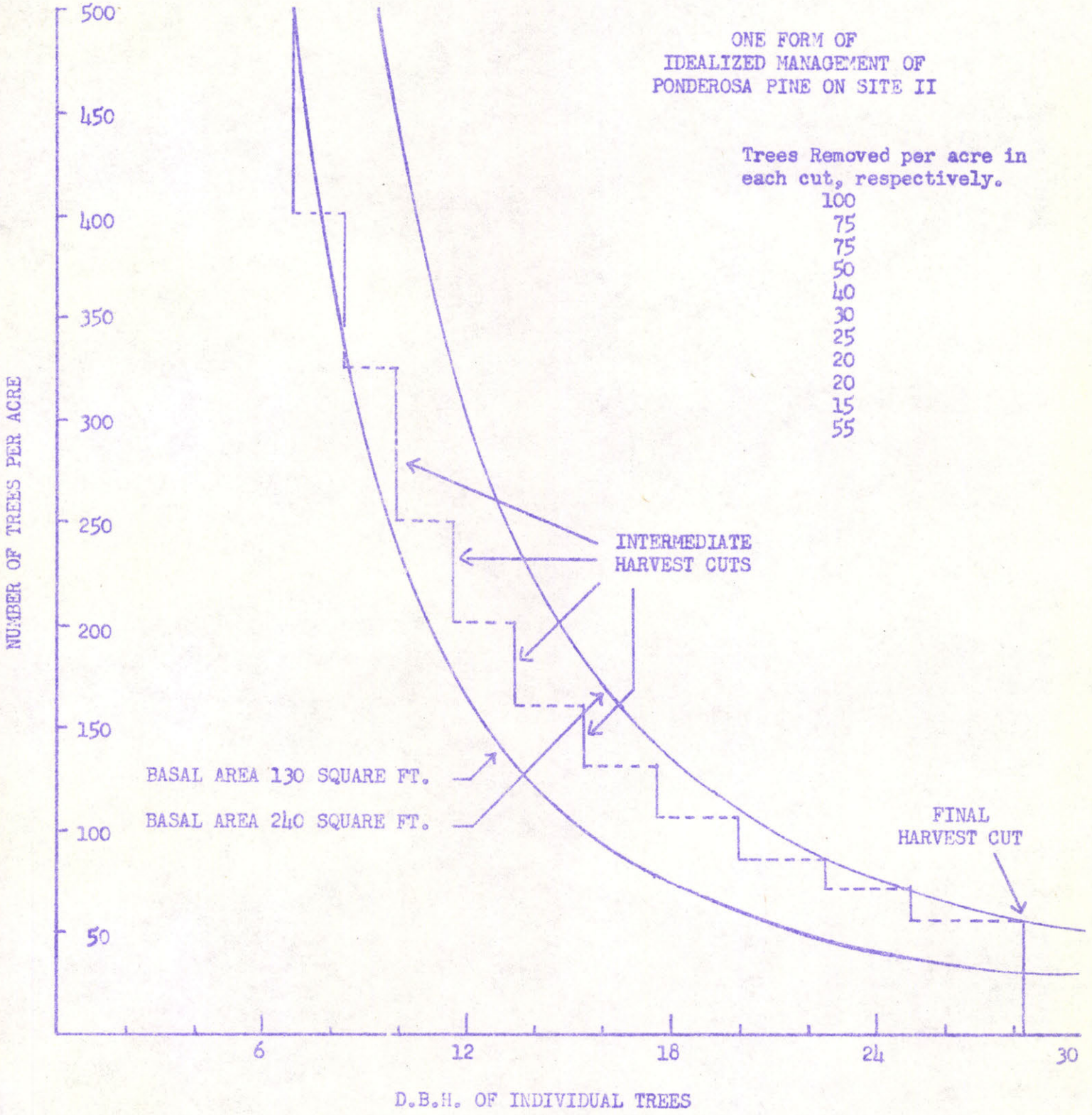
Prescribed burning can greatly reduce the hazard and danger of wildfires as was shown in the severe wildfire near Hobergs in late August of this year. This was nearly a perfect demonstration. One of the headfires came directly into one of the areas that had been prescribed burned. On the outside it had been crowning and there it burned off the needles and killed every tree in its path. But when the fire reached the area that had been prescribed burned it went to the ground, became relatively calm, and progressed rather gently through the pine needles on the ground. The fire acted much like one in prescribed burning, and it may have done more good than harm by removing debris and further reducing the danger of wildfires. At present (December 1, 1962) this area is well covered with a new crop of pine needles and in places it is difficult to see that it ever burned, while on the outside the soil is nearly as bare as the floor of this room and surface runoff has been very heavy. Such runoff can give rise to erosion on the slopes and flooding below.

Yes, it has been demonstrated that prescribed burning can be beneficial in reducing fire hazards. Furthermore, a forest management plan has been developed that will permit prescribed burning and if carried out will assure relatively low fire hazards on a continuing basis. Essentially, this management plan provides for clear cutting in spots at the end of a rotation cycle, cleaning and prompt restocking of these spots, the exclusion of prescribed fire in the spots of

reproduction until the new trees are 12 to 15 feet tall and can withstand a light fire, periodic burning thereafter to keep out understory reproduction and brush, frequent intermediate harvest cuts, and cleaning of all slash after each harvesting.

To explain this operation more fully, let us imagine we have 3,000 acres, markets are available for all trees over 6" DBH, and we wish to harvest trees every year. When trees are in properly stocked stands they grow fast, and light intermediate harvest cuts can be made frequently, perhaps every 10 years in any one spot as shown in the figure on the next page. The complete operation indicates a rotation cycle of 150 years. Theoretically, then, 20 acres would be clear cut each year, perhaps in 4 to 10 different spots, and 200 acres would be selectively harvested or thinned in intermediate harvest cuts. The clear cut spots would be cleaned of slash and managed to obtain fully stocked stands of reproduction, either by natural seeding or planting. Prescribed fire must then be excluded from all areas of new reproduction until the trees are 12' to 15' tall. After this time fire can be used to maintain low fire hazard conditions. It should be emphasized that no more tree reproduction is wanted until the end of the rotation cycle. The reason is that reproduction under older trees greatly adds to the forest fire hazard. Actually, the program outlined here is nothing more than farming crops of trees - we get a stand of trees following clear cutting at the end of the rotation cycle, and then we are concerned for many years with the growing out and harvest of this crop.

The 200 acres thinned in intermediate harvest cuts would be cleaned by prescribed burning. Thus, under idealized management, approximately 220 acres of logging slash would be removed each year. This acreage with about 80 other acres in the pre-harvest cut stage,



Frequency at which cuttings might be made in ponderosa pine and prescribed fire needed to remove slash.

might be sufficient to maintain low fire hazard conditions in ponderosa pine management. If so, this would be prescribed burning about 300 acres every year in the 3,000-acre forest, or about 10 percent of the total area. However, the wildfire at Hobergs in August indicated that a 10-year accumulation of needles on the ground can produce tremendous heat under extremely dry conditions and therefore burning each spot about every 5 years might be better.

Our research on prescribed burning has also included the relationships of light fire to other aspects of land management. Most of the following studies have been completed and published as indicated in the list of titles at the end.

1. Methodology of prescribed burning and the cost of each step in the operation. Rate of fuel increase after prescribed burning.
2. Relationship of pine needles to burning - amount of needle fall, season of needle fall, horizontal distribution of needles and duff on the ground before and after prescribed burning, coincidence of needle fall and rainfall, coincidence of needle fall and seed fall, amounts of needles and duff removed by prescribed burning.
3. Fuel reduction by successive broadcast burns.
4. Measurement of fire hazard reduction.
5. Effect of prescribed burning on the soil - pot tests of available nutrients, effects on total soil nitrogen, effect of burning on soil pH.
6. Stability of soil as related to prescribed burning - studies based on quantitative data, runoff plots.
7. Relationship of understory forage and brush seedlings to burning and to trees.
8. Breeding of tree killing insects as related to prescribed burning.

9. Relationship of forest rodents to prescribed burning.

10. Rainfall interception as related to dead fuels.

NEEDED RESEARCH AND DEMONSTRATION

The research and demonstration in ponderosa pine should be expanded now to include areas where other brush species are involved and where white fir and incense cedar are more prevalent in the stand than on the Teaford Forest. As soon as this is done, prescribed burning should be extended to other forest types such as the coast redwood, Douglas fir, Big Trees, and mixed conifer where severe fire hazards now exist.

We all know that adequate fire protection is the first essential in good forest management. But with complete protection over the years, great changes have taken place in our forests of California and tremendous fire hazards have developed in many places. In the past 10 years wildfire conflagrations have destroyed a wealth of vital resources, and these losses are sure to continue periodically in the future so long as we maintain the hazardous fuel conditions that now exist. In view of this situation, we must move fast with research and demonstration of this sort. But research and demonstration need not hold up an action program. I would recommend that an action program be started immediately by typing areas of ponderosa pine where prescribed burning can be done and by training personnel to do the work.

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