

ANALYSIS OF DOUGLAS FIR

SNAG REMOVAL

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Analysis of Douglas Fir

Snag Removal

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## ANALYSIS OF DOUGLAS FIR SNAG REMOVAL

### Introduction

The cutting or burning of standing dead trees to better the chances of controlling forest fires has long been a primary need from the forest protection standpoint. Disposal of snags has been carried on most commonly by felling with ax and saw. Pushing the snags over with a tractor, blasting, and burning are other methods in use, but only on a trial basis.

This study was made to show the results of Douglas fir snag burning and to indicate the possibilities therein. Snag burning experiments have been carried on for Ponderosa pine, but as yet none are established for Douglas fir. The need is evident because of many snag patches resulting from serious fires. Active decay increases the fire hazard as time goes on.

This writer had the good fortune to work on a hazard reduction project on the Neff timber sale of the Union Creek District of the Rogue River National Forest during the months of November and December of the year 1939. The hazard reduction consisted of tree-tops and snag disposal financed by a charge of 15¢ per thousand for sugar pine removed on the sale. The sale contained three snag patches and also scattered snags elsewhere. The

ground cover of the snag patches consisted of abundant snowbrush while the timbered areas had scattered brush and reproduction.

Artificial snag removal in Douglas fir is more necessary than in other species because these snags often remain for fifty years or more. The methods used for snag disposal on these sales were felling and three methods of burning as described later. Records on snag disposal were kept on the project for this analysis as shown in the following pages. Different methods of burning must be employed for different species of trees because of varying characteristics and decay activity. For instance, the Douglas fir snags decay and break off above ground while on the other hand Ponderosa pine will decay at the roots first. These are significant factors in snag removal.

This hazard reduction project has offered a fair test of the methods used because of sufficient numbers.

The advantages of artificial snag removal are many. Most important is fire hazard reduction. This is best shown by the Buck Basin fire on this District in the year of 1936 as shown by the Forest Service records. This fire was corralled when small but escaped because of the many snags present. The cost of the fire was \$4027, which it is estimated would have removed all of the most serious snag hazards on the District. Other advantages are:

protection of valuable reproduction, improvement in aesthetic value of forests, insect and decay protection.

The work was carried on by two fire guards, Clyde Onn and the author, after the fire season was closed.

### Objective

Why seldom more than 80% of the snags fired by these methods burn, and under what conditions they may best be burned are questions for which answers were sought by the study described in the following pages. In designing these investigations the following points were kept in mind: inflammability of Douglas fir snags in relation to decay and tree characteristics; a comparison of various burning methods; a comparison of felling and burning of snags; and to determine the season and weather conditions most favorable to burning by the three methods used.

### Methods of Snag Removal

The two most applicable methods of snag removal are burning and felling. Both of these methods were used on this sale.

Three types of burning were employed. First, the "hole in bark" method which is cutting a square hole or a narrow angular cut between ridges of bark usually at a crack. This hole is cut to solid wood. In many instances the bark must be cracked and loosened permitting the fire

to draw. A small sliver of pitch ignited is placed in the hole at an angle so it will remain until burned. This hole is placed as close to the ground as the tree is dry. This method is used on trees having decayed sapwood with shelled bark, large cracks, barkless but largely decayed snags, cracked or loose bark, and in all cases dry underneath the bark. The hole need be only large enough to insert one small piece of pitch.

Second, the base fire method consists in kindling a fire at the base of a snag near or under a cut chopped through the sapwood. Usually bark is piled against the tree to increase the effect of the fire. This method is used on trees having decayed sapwood, on peeled Douglas fir, on catfaced trees, on those with pitch deposits near the base, and on hollow snags. This method worked especially well on the few sugar pine snags burned.

Third, the chunk method consists in leaning a stump or chunk of a log against a snag. A fire is kindled between the chunk end and the snag so as the fire burns, the weight of the chunk will continue to bear against the snag, eventually burning through the snag. This method is used only on catfaced trees, cracked trees, case hardened trees, and on wet trees. The chunk method is used only on most adverse conditions and when a complete job is desired.

The ordinary method of felling snags with a saw was used on this job. This method is not limited to conditions of the snags. Felling snags offers only two important advantages. Direction of fall can be controlled in possibly forty per cent of the cases, and this method is not limited to low fire hazard periods. Though the costs are higher, this method offers the only sure and also practical way of eliminating snags.

#### Costs

Probably the most important phase of snag removal and methods used is the cost phase. The number of snags divided by the total cost gives the cost per snag.

The burning of snags is found to be the cheapest method of eliminating them. The actual cost for each snag ignited was found to be 6.4 cents per snag. The actual cost of snags that burned completely or to a lesser degree was found to be 7.1 cents per snag. The cost per snag varies between the three methods outlined in this report. No actual data on each method was kept, but by comparing the methods it is found that the "hole in bark" method is the cheapest, the base fire method next in line of cost, and the chunk method most costly of all. This conclusion is deducted from an explanation of the details of the three methods.



The actual costs of felling snags on this project figures out to be 65 cents per snag.

The facts that constituted these costs are explained in the following pages.

The result of the cost analysis points to the "hole in bark" method of burning to be the cheapest from every standpoint. The burning method is also found to be the most practical method because only small crews are necessary and also because more complete reduction of hazard is accomplished.

#### Data Obtained and How

The costs as previously stated are of no value if they are not based on actual information and sound reasoning. To support these costs an analysis is made of their composition.

By actual count in the field after the burning was completed the per cent found to be burned completely<sup>Down</sup> was 19.6% of the total. The per cent of material burned was determined by estimate in the field while gathering other data. This is shown on a graph included in this report. It was decided that a snag burned to thirty feet or less has had most of its hazard reduced so an actual count was made in the field. The result was 63% of the total. Only 8.9% of the fires set did not burn. The average age of the

dead trees as snags was determined by records of the burn, by age of reproduction on the area with a correction for seeding, and by the condition of the snags, such as, the number of limbs remaining and the extent of decay. The average age was found to be approximately 35 years. The actual height and diameter limits of the snags as measured in the field were found to be 20 to 200 feet and 18 to 69 inches. The average height and diameter taken from data on snags felled on a contiguous area were found to be 100 feet and 3 feet respectfully. The average age of the trees before death was determined by a count of full annual rings on all diameter classes and was found to be about 250 years of age. The size of the sale area minus the area on which snags were felled gives 160 acres as the burning area. The man days required for the burning was 6.7 days taken from records kept on the job. A total of 470 fires were set and only 83 per cent of the total was counted, later, giving 388 as the figure on which the percentage was based.

The composition of the snag felling costs must be analysed also. Forty and one half man days were required to fell 280 snags that averaged 3 feet in diameter. The extent of the snag felling area was 60 acres. These data were found in the field and from the records of the job. Actual measurement of all diameter classes and enough to

compensate for errors incurred by broken snags was made for average height determination which was about 100 feet.

The extent of decay found on this area was estimated by observation while the count was being made. *Polyporus schwienitzii* (red-brown butt rot) was responsible for an estimated 90% of the decay. *Trametes pini* (ring scale fungus) and others less prevalent were also present.

The costs involved 4 dollars per man day and 18 miles at 5 cents per mile for each trip.

### Results

All three burning methods were successful, but in varying degrees because of the lack of uniformity of the snags.

The "hole in bark" method was by far the most successful as it was used on an estimated 70% of the total. The method will often burn snags when no other method would because many snags are wet a few feet above the ground and by chopping above the wet butt a fire will burn and drop fire which will dry out the base and eventually burn. More complete destruction of the snag is offered by this method because a greater number can be fired by this method than any other and because it offers a fire that climbs and burns the trunk where often the other methods merely burn it off at the ground. This method has

the advantage of being by far the cheapest because it requires so little time to start each fire. The "hole in bark" method is successful any season of the year and regardless of snow depth. This is found to be true because many snags do not dampen underneath the bark. A noticeable disadvantage of this method is evidenced by the remaining of occasional stubs from a few feet in height to possibly forty feet which are greatly but not completely reduced in fire hazard. Practicability of this method is limited to dry snags and can be employed on areas with a heavy cover of inflammable slash because it can be done with snow on the ground. The "hole in bark" method often burns snags while standing, eliminating destruction to reproduction by fall and by burning after falling.

The base fire method is the second in line of success. Estimated use was about 25% of total. Building a fire at the base of a snag often burns them out at the roots resulting in a complete job of hazard reduction. Decay at the base of a snag materially increases the chances for its disposal by the base fire method. Case hardened, catfaced, and pitchy snags may be disposed of by this method for which the "hole in bark" method would not be possible. Not all snags may be ignited by the base fire method. Snags without bark that have less

than one-fourth visible decay at the ground line will seldom take fire. Old charred snags from which sapwood had previously been burned will not ignite from a base fire. This method requires a longer time to build and fire material must always be present. The use of this method in Douglas fir is limited because of wet butted trees found to be quite prevalent.

The chunk method is least successful because of time required and lack of ready chunks. This method will work in the most adverse conditions where no other method will. The chunk method was used only occasionally and probably on not more than five per cent of the total and can be advantageously used in conjunction with the other methods.

#### Observations

Observations made during the work and general conditions prevalent indicate that best results are obtained when the following points are considered:

1. Douglas fir snags are most successfully burned in the fall when the heart and sapwood moisture content is lower than in spring.
2. Sapwood decay is the largest single aid in the success of the "hole in bark" method. Heartwood and root decay are the greatest aids to the base fire method.

3. By observing the bark, the dampness of the snag, the decay, the catfaces, and the condition of limbs (small limbs indicating a recent snag) an experienced worker can determine which method to use if any are practical.

4. No experiments were carried out as to age limits for best burning. The minimum age limit for the "hole in bark" method is controlled by the time when the bark loosens and the sap decays.

5. This snag elimination process was carried on during dry and freezing weather, rainy weather, and foggy weather; with no appreciable effects on the "hole in bark" method of burning.

6. A snag burned the full length but not down is reduced in fire hazard for a period of years.

7. The most successful igniting material found on this project was pitchy wood. Pitchy wood is usually present and takes so little time to obtain that the actual time spent is negligible.

8. In this area it was found that wind and low humidity are aides in snag burning, but not controlling factors.

9. An ax is the only tool necessary for snag burning.

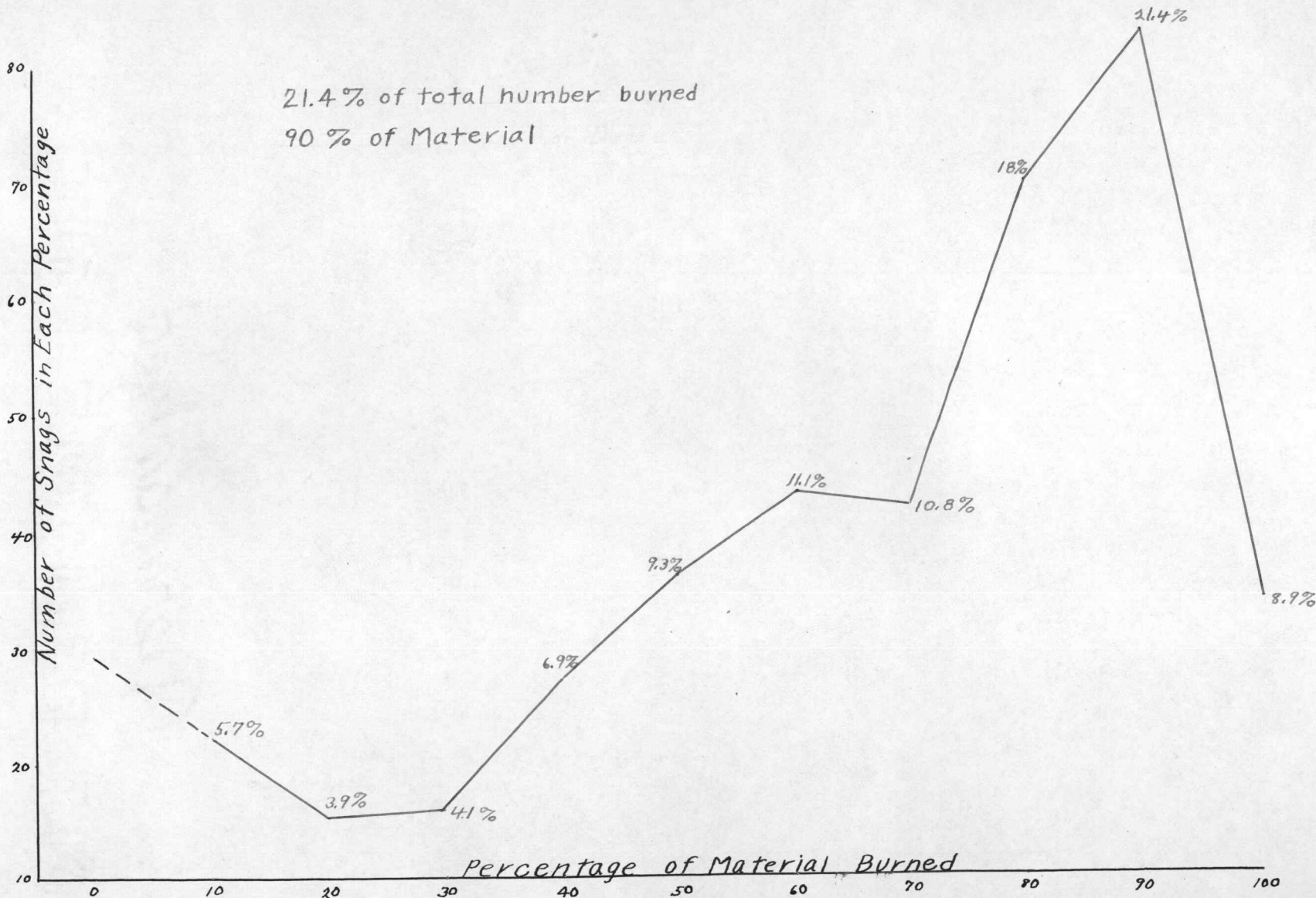
Recommendations

The recommendations to be compiled from this study are based entirely on conditions as they were found on this project hence in applying them to other areas, they should be coupled with new conditions as found on other areas.

From the data obtained, it is evident that burning of snags on this sale was the cheapest and most efficient method to employ in disposing of the snags. The burning method found to be most efficient from the standpoint of cost and effect was the "hole in bark" method. The base fire method and the chunk method are recommended for use in conjunction with the "hole in bark" method, but not as the leading methods.

Hazard reduction financing should be based on the hazard of the area of the sale and on the saleable volume removed. This basis necessitates a variable rate for hazard reduction.

It is needless to say that snag removal should not be limited to timber sales because forest fires are not so limited. This method of financing is good but should be supplemented by other methods.



Percentage of Material Burned  
Graph of Burned Material

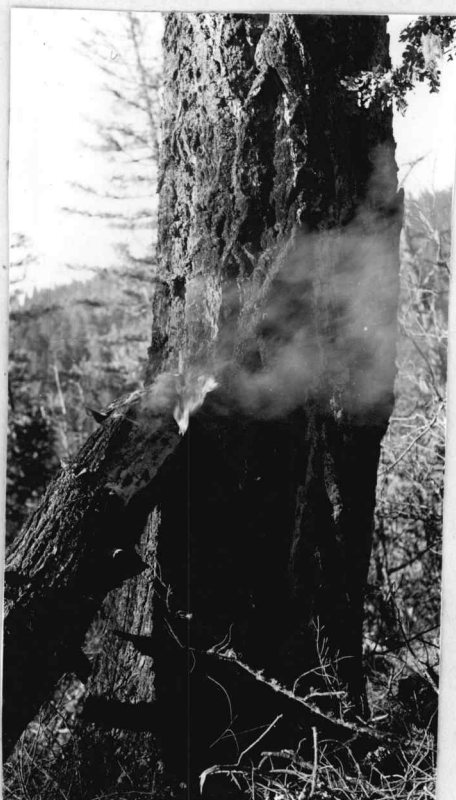




Hole in Bark Method  
of Burning



Base Fire Method  
of Burning



Chunk Method of Burning