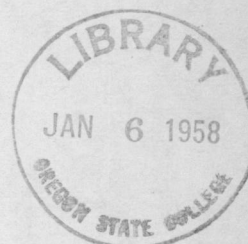


SLASH DISPOSAL IN THE DOUGLAS FIR REGION

SEMINAR THESIS

NOVEMBER 24, 1931



LEE HUNT

*Accepted
Filed #
P.M.P.*

SCHOOL OF FORESTRY
OREGON STATE COLLEGE
CORVALLIS, OREGON

TABLE OF CONTENTS

INTRODUCTION

	Page
I. PURPOSE OF THIS PAPER	1
A. Creating an Interest in this Problem	
B. An Investigation of Present Practices of Slash Disposal	
II. Historical Background	2
A. Timber Mining	
1. Waste in Lumber Industry	
2. The Disregard for the Future	
B. The Slash Disposal Question	
1. Lack of Regulations	
2. Results of Disposal Methods	
3. Improvement of Methods	

THE PROBLEM

I. The Needed Data	7
A. The Approach to the Problem	
1. Analysis of Modern Methods	
2. Results of Modern Methods	
3. Public Relations	
B. Limitations of Investigation	
1. Methods of Burning	
a. Swamper Burning	
b. Spot Burning	

c. Piling and Burning

d. Broadcast Burning

2. Nature's Method

II. The Soap Creek Sample Plot 12

A. Location of Area

B. History of Area

C. The Slash Burned

1. Time of Burning

2. Character of Burn

3. Effect of Burn

a. On the soil

b. On the vegetation

D. Chances of Reproduction after Burn

1. Vegetation on the Area after Six Months

2. Vegetation a Year later

3. Seeding in from the Side

E. Chances of Reproduction if the Area Had Not Been Burned

1. Seed Stored in the Duff

2. Seed from Seed Trees

3. Advance Reproduction

F. Fire Hazard of Area

1. As it is, burned over

a. Mineral soil exposed

b. Charred logs and vegetation

c. Rapidity of decay

d. Chances of another fire

e. Erosion, water capacity, and other factors affected

2. If it were not burned	
a. Soil condition	
b. Debris as protective covering--Decay	
c. Intensive protection	
III. Experiments in Slash Disposal	Page 19
A. Priest River Experiment Station	
B. Pacific Northwest Experiment Station	
1. Forms used and purpose of the investigation	
2. Extent and results of the work	

CONCLUSIONS

I. Fulfillment of the Object	25
A. Importance of the Problem, Exemplified by Research	
B. Enforcement of Regulations	
1. Need for revision of regulations	
2. Need of better fire protection	
II. Solution of the Problem	26
A. Readjustment of Ideas on the Subject	
B. Intensive Utilization	

REFERENCES

*** REFERENCES ***

- F.H. Lamb, Legalized Forest Destruction.
Timberman, Page 49, 1925
- F.H. Lamb, To Burn or Not to Burn.
Timberman, November 1925
- L.D. Blodgett, Slash Disposal on Steep Slopes in the Douglas Fir
Slopes in the Douglas Fir Type.
Forest Worker, Page 12, May 1929
- G.C. Joy, Comments on "To Burn or Not to Burn".
Timberman, November 1925
- E.T. Allen, A Discussion of Fires and Logged-Off Lands.
Timberman, December 1926
- T.T. Munger and G.L. Drake, Snags.
Timberman, December 1926
- F.E. Pape, West Coast Lumberman
Page 38, March 15, 1922
- J. Sutherland, Four-L Lumber News
Page 16, May 1926
- J.E. Patterson, The Relation of Highway Slash to Infestations by
White Pine Beetle in Standing Timber.
U.S.D.A. Technical Bulletin, Number 5
- Relation of Insects to Slash Disposal.
U.S.D.A. Bureau of Entomology
Department Circular, Number 411
- Demmon, Fires and Forest Growth.
American Forests
35:273-6, May 1929
- R.D. Hall, Keep Out Fires--Nature Will Do the Rest
Coal Age
34:351-2, June 1929
- J.A. Larsen, Study of Natural Reproduction on Burned Forest Areas.
Int. R. Ag.
19:901-2, October 1928

A.M. Muller, Destructive Fires in Western Oregon.
Paper, 35:414-15, December 25, 1924

W.J. Perry, Those Harmless Surface Fires.
American Forests,
32:536-8, September 1926

J.S. Boyce, Decay and Seed Trees in the Douglas Fir Region.
Journal of Forestry
25:835-9, November 1927

J. Roeser, Study of Douglas Fir Reproduction Under Various Cutting
Methods.
Journal of Agriculture Research
28: June 21, 1924

H.E. Hoefner, Some Slash Disposal Observations in the Douglas
Fir Belt.
Journal of Forestry
25: 560-3, May 1927

SEMINAR THESIS

SLASH DISPOSAL IN THE FOG BELT

*** INTRODUCTION ***

I. PURPOSE OF THIS PAPER

A. Creating an interest in this problem

With the advent of more intensive management and closer utilization of the forests throughout the United States, the much discussed and hotly argued question becomes even more pertinent, that of the disposal of slash left from logging operations. Although there is a noticeable lack of scientific data upon the rate of slash decay, start and growth of reproduction, the effects of burning and similar factors, many opinions have been expressed, too many of which have been based on individual prejudices. The problem resolves itself into the question of whether the slash should be burned or left on the ground, and men in forestry seem to be fairly evenly divided into the two factions, one for and the other against the burning of the slash. It is not for me to state here what my convictions on the matter are, as that would have the tendency to incur the enmity of those who take the opposite stand; so may I here say that the chief object of this paper is to creat an interest in the problem, to get the foresters, the loggers, the lumbermen to study the issue and after analizing both views, to act in a way that will further forestry and bring the largest continuous income or yield from our forest lands.

B. An investigation of present practices

How can we as foresters, loggers, lumbermen best accomplish the work of solving so difficult a problem? No doubt the most feasible plan is to investigate the present situation to find out just what practices are being

followed by most of the logging concerns, to determine why they broadcast burn or why they lop and scatter the slash. If we can understand the methods now in practice and approach the problem from the loggers standpoint and then from the foresters standpoint, we will have a good background, a substantial foundation on which to base our opinions. The study should at least point out many of the weaknesses of the present systems, and may give some clues as to a means of correction of the faults, and the damage that is done annually by those who are ill-informed upon the subject of slash disposal.

There are, and have been, a great many workers in this field, and today a wider and more intensified interest seems to be prevalent among the men who are concerned with forestry. Definite scientific data on the different phases of slash disposal ^{are} ~~is~~ lacking because of the time and difficulty in gathering material and conducting experiments along this line. However, many writers have through observation gathered much material and after organizing it have drawn certain conclusions concerning the problem. Few of these agree and will often vary widely in their conclusions concerning the same area, that is, two men's observations of the same tract might be very different according to how each interpreted the material on the land. Some of the more prominent workers in this field are: Frank H. Lamb, G. Kempff, H. E. ~~Hayfner~~, and J. R. Weir. The Pacific Northwest Experiment Station at Portland, Oregon, is carrying on a very extensive investigation of the slash disposal question, with definite, accurate data on practically all the factors that affect the problem. This survey, while not complete and ready for publication, is very important and will be discussed in detail later. Other experiment stations and many foresters throughout the country have come to realize the importance and magnitude of this question.

II. HISTORICAL BACKGROUND

A. Timber mining

In order to understand the present situation and secure a fair

foundation upon which to form our opinions on the question of slash disposal, we need to know something of the history of forestry and particularly the part slash disposal has played in the past. As this study is limited to the region west of the Cascades, or to the Douglas Fir forests, let us concern ourselves with just the history of Douglas Fir and the slash disposal in this region.

We are all familiar with the history of the lumber industry, as it moved from its starting place in New England, westward to the Lake States, where vast tracts were cut over, and enormous fortunes made almost overnight, then to the south, where the pineries became the center of the lumber producing industries, and finally not so many years ago the shift to the almost limitless expanse of virgin forests of the Pacific Northwest. From the time the first tree was cut to build a home for the Pilgrims, the American people have always seen a forest resource so vast that the possibility of its becoming exhausted was beyond the human conception, therefore no measures were taken to practice careful utilization or to secure regeneration on the logged areas. The amount of waste was terrific; enough usable wood was destroyed or left to rot on the ground in the three eastern regions to supply our nation for a goodly number of years. The people felt that their posterity could reach out into new regions for timber, even as they had done, therefore, we find a total lack of preparation for the day when the forest would be gone. Many thousands of acres of this logged off land were burned over just to rid the ground of the slash or debris, and in so disposing of the slash the people seriously jeopardized their chances of being able to use the land profitably for many generations, because the fires were so hot as to preclude the possibility of natural regeneration of the forest and caused considerable injury to the soil.

Here in the west the problem was magnified many times because of the enormity of the operations. Whereas the operators of the New England states worked with hundreds of acres and the operators of the Lake states worked with thousands of acres, the western lumbermen were conducting operations of ten, twenty and even a hundred thousand acres. Stumpage here in the Northwest was obtained at first for little or nothing, and as development increased the prices took an

upward curve. The successful operators from the Lake states saw only the desirability of obtaining more stumpage and they borrowed heavily to get it; not taking into account the excessive costs of transportation and the fact that they were overcapitalizing and otherwise making their own industry unstable. This condition produced an economic pressure that forced the timber holders to cut their stumpage as fast as possible, thus liquidating their capital. If the operator were forced by economic conditions to liquidate his capital to escape bankruptcy, surely he would be in no condition to provide for a future crop by reproducing a forest on the logged area. To rid the land of the slash and debris after removing the equipment the operator fired the area and burned over the logged land with the result that many times additional tracts of good standing timber were destroyed. This was the accepted practice throughout the northwest and led to specific legislation along the line of slash disposal; let us look at the evolution of this legislation on the slash disposal question.

B. The Slash Disposal Question

Evolution of the legislation on Slash Disposal -- With the immigration of Lake States lumbermen into the Northwest came methods and practices of the old region which were not in any way adapted to the new area. The early loggers were under no obligation to try to control the fires that they set either accidentally or for the purpose of clearing the ground of the debris. Slash fires, along with many others, ran wild over the logged areas, entered mature virgin stands of timber and destroyed many millions of acres of our best timber. Even with the settlement of the country nothing was done to abate the evil of firing the forests and at times whole towns were wiped out by the flames, with subsequent loss of life. The practice was so generally accepted and arguments put forth so misleading that legislation was inaugurated to legalize slash disposal by burning. The beneficial and harmful effects of the practice of burning will be discussed later, sufficient to say that by 1923 Washington had a law to the effect that the slash nuisance must by some means be abated, and failure of the owner to comply involved only the action of the state forester who burned the

debris and attached a lean on the property. Likewise Oregon had passed legislation even more rigorous than that; requiring specifically that the slash was to be burned, and providing for a fine and improsonment for failure to obey. One outstanding, glaring weakness of the legislation was its failure to provide allowances for damages caused by slash fires that got out of control. The many other factors that should be taken into consideration in slash disposal have been neglected, chiefly because of lack of knowledge on the part of the legislators, the men in the forestry industry and the general public in regards to this vital question. While many do not agree with Mr. Frank H. Lamb when he makes the three following statements, they at least give us substantial food for thought:

1. "The present policy of slash burning as provided for in Oregon, Washington and in Federal regulations is endangering the safety of the remaining standing timber of the Pacific Northwest, and with the extension of our cutover areas into continuous bodies of wide extent, will eventually mean a holocaust with terrific destruction and possible loss of life.

2. "The present method of slash disposal as provided for and recommended by foresters is seriously delaying reproduction on a large part of our cutover lands and is absolutely preventing it on the balance. That any plan of disposal of slash by burning even though limited to one burning is detrimental to reproduction on the cutover lands of much of the Pacific Northwest.

3. "Cutover lands can be fire proofed cheaper, in less time with far greater degree of safety and with a much better chance of reproduction without burning; that is by Nature's Method; by encouraging the coverage of the land as soon as possible with second growth. An herbaceous or young forest cover is the only possible insurance for cutover lands short of consuming the entire slash through recurring fires over a long period of years and rendering the land absolutely valueless for future forest purposes."

These statements were made after Mr. Lamb had studied and observed two plots, one burned the other unburned, over a period of his twenty-five years ex-

perience and deals with what is known as the fog belt which includes the territory from the coast inland to the valleys between the Coast and Cascade ranges.

In summarizing the situation may I put these questions before you? In spite of the fact that we have made great strides in the development of logging equipment, means of transportation, etc., what have we accomplished in the way of working out a feasible slash disposal system? The laws are still in effect, areas are still being razed by fires and the bare, denuded, blackened mountains give mute evidence that the devastated areas are increasing almost beyond our conception. One great step forward is being taken, that of investigation, which means that an active interest has been aroused and the need for work on the problem realized; and with this we may expect to gradually overcome the evils that are and have been attending the practice of slash burning.

*** THE PROBLEM ***I. THE NEEDED DATA

A. Approach to the Problem

The magnitude of this problem makes it impossible to cover the entire question of slash disposal and there has been so much written upon the subject that comment upon the work previously done will of necessity be brief. I would, however, like to incorporate the thoughts of a few men whom we know to be authorities in this matter, and then to submit what meager observations I have been able to gather for you to think about. To get anything like complete data would require years of study, observation and work, such as only the government is able to carry on, but fortunately there are many logging operations, and burned or slash covered areas around us that are good representative examples of what is done to the slash and what the effects of present methods of slash disposal are, therefore, after a brief resumé of the present methods of slash disposal and my reactions to such, I shall present the observations of one such area for your consideration. As stated before this investigation and report is limited to the Douglas Fir region west of the Cascades.

B. Limitation of Investigation

Although there are a great many methods of slash disposal in operation throughout the country, some of which are proving quite successful, many others are being invented and tried out each year; for convenience I shall list and discuss but five methods which I consider are of importance here in the Douglas Fir region.

1. Swamper Burning. This is a comparatively new method of slash disposal and has grown in favor in the last few years. It is discussed by Westveld in the February, 1926 issue of the Timberman and while the article deals only with it as a method in the pine region it has been introduced into the Fir forests here near the coast, and is highly recommended by some foresters. The procedure under

SCHOOL OF FORESTRY
OREGON STATE COLLEGE
CORVALLIS, OREGON

this scheme is to burn the slash and debris as soon as the timber is cut, the green slash being thrown directly upon the fire, even before the logs are skidded out of the woods. The practice is to pile and burn the brush ahead of the skidders, thus making but one operation of piling and burning, and the work is done by the swamping crew. This method has been in use for twenty years in the Lake States and proved very successful and has been brought west where the Oregon Lumber Company was using it at the time the article was published. Some of the particular advantages of the method are: 1. It ^{ke} moves the fire hazard as soon as it is created, because there is no slash to hold [^] over the dry season. 2. Does less damage to the reproduction that may be coming up and does not injure the trees that are reserved to reseed and restock the area. This is because one pile in swamper burning is equivalent to three to five piles in the piling and burning method, and as the slash is burned green it burns more slowly, with less heat and consequently with less damage to the vegetation that remains on the area. It gives a good clean burn and is no more expensive than piling and burning.

The swampers are willing to work under more adverse weather conditions because they are working about the fires part of the time.

It reduces the cost of logging by increasing the ease of skidding as the brush and debris is removed before the skidding, also the logs can be more easily bunched, to the extent of about twenty per cent. increas in bunching capacity. Although it has the disadvantage of being applicable only during the wet season of the year and all the disagreeableness, and difficulties of winter working, indications point to its success and acceptance as a method slash disposal in some regions.

2. Spot Burning. This method is classed by some as a modification of broadcast burning which will be discussed later, but it has nummerable characteristics that warrant it being classed as a separate method of slash disposal. The primary object of this practice is to eliminate as much debris and slash as possible with a minimum amount of expense and labor. The procedure is to go through the area and find those place^s such as the bottom of steep hills, canyons,

etc., where the slash has accumulated, then burn the slash in these places being careful to keep the fires under control. While this method does not fire the entire area and thus spares much of the reproduction it cannot be recommended as a satisfactory system for several reasons.

The season of the year that burning is possible is decidedly limited as any fire in the woods during the dry season is extremely dangerous.

The slash and debris is scattered over the area to such a degree that it would be difficult to find spots that would be profitable to burn and watch.

The costs parallel that of piling and burning and the work is not materially lessened.

3. Piling and Burning. Historically, piling and burning of the slash is the oldest method of artificially getting rid of the debris and slash after logging. It has been used extensively in Europe for a great many years and was found to be practical in the hardwood and pine forests in eastern United States and is feasible wherever the amount of slash is limited and where the labor costs are not unreasonably high. The procedure is to put the tops and limbs of the trees in piles, which are burned in a favorable season. This method can very well be subdivided into intensive and extensive piling and burning. In the former the labor and costs are essentially high as the particular places are selected on which to make the piles for burning and also the larger limbs and tops must be cut up so as to make handling easier and more compact piles, which are usually circular and conical in shape. The larger the piles are made the farther the slash must be carried, involving more labor and higher costs and also an increase in danger and injury to surrounding vegetation. Piling the slash in rather long rectangular formations is often advantageous and less expensive with some species. In the extensive application of the method the slash is roughly bunched in the logging operation and systematic bunching is not attempted, which leaves much of the debris scattered over the area. It is evident that with the large scale operations of the Northwest and the oppressive transportation, taxation, and production costs the logger is in no position to practice the intensive method of piling and burn-

ing, and the extensive is little better than spot or broadcast burning. With the readjustment of the entire lumber industry and closer utilization of the forests, piling and burning may become one of the predominant methods of slash disposal, as piling when the logging is in progress is easier and cheaper and facilitates the work of skidding. Two distinct operations are necessary in piling and burning, first the work of arranging the slash preparatory to the actual burning and second, the return to the area at a later date to burn the piles. Both require considerable care and work as the piling must be done so as not to interfere with the logging operation or present a hazard to surrounding bodies of timber, and the burning must have ideal weather conditions, precautions against the fire getting away and care in the method of progressing over the area; the expense alone will eliminate this method for many years until forestry has become more stabilized.

4. Broadcast Burning. This method of slash disposal has been in practice since the beginning of logging operations in the Douglas Fir region and is more widely used than any of the other methods of ridding the ground of debris. Usually no thought is given to the future use of the land, but the whole area is fired and burned over. Quite often care is taken to control the fire by the use of natural and artificial fire-breaks around the area and some operators place lines around blocks and burn only a limited area at a time in order to lessen the danger from the fire getting beyond control and destroying valuable timber adjoining the tract. Hawley recommends that these blocks should not be over forty acres in extent. Although by far the least expensive both as to costs and amount of labor required and although it is used almost entirely in the Fog Belt and sanctioned by law, this method has a great many disadvantages. The time to fire the slash must be carefully selected so that a raging fire will not sweep over the surrounding country; also a fire hot enough to consume even the greater part of the debris will undoubtedly destroy any reproduction and trees left after the logging operations. If the debris is not all consumed, the fire hazard is only increased not lessened by the burning. A clean burn on the other

hand not only rids the area of the slash but burns the litter and humus from the soil and destroys any seed stored there. Many precautions could be innumera-
 ted that would lessen the danger of broadcast burning, but in the final analysis it
 will be found to be a very unsatisfactory method of slash disposal. Lamb states
 with emphasis that any safe slash fire is worthless as it only destroys the light
inflammable material and leaves the heavier material in a more inflammable condition
 than before. All the above methods discussed depend upon burning as the means
 of disposing of the slash and none have been found adequate to meet the very
 grave problems of complete slash disposal. Already slashing fires have destroy-
 ed enough of our timber, and have left devastated and injured soil so that many
 years must elapse before the land can be returned to a productive state. This
 has caused a hiatus, from the cutting over of the timber, till another crop of
 trees can be grown, which could readily have been eliminated if lumbermen the
 country over and particularly here in the Northwest had kept the fire out of
 the woods and given Nature a chance to reclothe the denuded hills with trees.
 Then let us look at one method of slash disposal that keeps the red demon out of
 the woods.


5. Nature's Method. Mr. F. H. Lamb has aptly called this method of
 slash disposal Nature's Method as it relies almost entirely on the forces of Nature
 to dispose of the slash and fire-proof the area. There are several variations
 to this method, a few of which I shall mention briefly. The least expensive but
 not entirely satisfactory scheme is to leave the slash where it has fallen in
 the logging operations and let the new growth grow up through and over the fall-
 en debris. Involving a little more work, but increasing the effectiveness is the
 method of lopping the slash, that is, cutting the larger pieces of slash into
 smaller units so that they will decay more rapidly. Finally, lopping and scarrrer-
 ing the slash which costs more to do, but gives better protection. It is quite
 true that for sometime the needles, twigs and small limbs present a considerable
 fire hazard, but not as much as though they were partly burned by a light broad-
 cast burn. A surprizing amount of seed stored in the litter and duff of the

forest floor is exposed, to light and heat by the logging operation and is stimulated to germinate thus beginning the process of reproducing the forest, which would otherwise have been hindered or stopped altogether by fire. How much better it would be, to apply the money used in burning slash, to trail building, fire lines and other means of protecting the area.

Heretofore we have been speaking in generalities and making statements that anyone might rightly and ably refute or deny, let us then narrow our discussion to one particular instance; one with which many of you are familiar, and try to apply some of the generalities and statements made above.

II. SOAP CREEK SAMPLE PLOT

A. Location

Typical of much of the area throughout Oregon and Washington in respect to topography, stand of timber, methods of logging and slash disposal, the small logging operation just north of Corvallis offers an excellent chance to observe some of the effects of burning on an area. This plot is on a small stream, Soap Creek, Section 35, Township  Willamette Meridian, and stumpage is being cut on the hills that form the sides of the stream, making it possible for us to observe over a period of years the effects of broadcast burning.

B. History of the Area.

We are told that when the first white settlers came into this region, they found an open wookland consisting chiefly of oak and maple with an occasional fir. This is borne out by our own personal observations, as we find remanents of these trees in the large "wolf" trees and receding maples and oaks, that are being crowded out by the more aggressive fir. The result was a dense, pure stand of second-growth Douglas Fir. In the summer and fall of 1930 the area was logged, with skidding by horse power as the method of logging.

In the fall the area was fired about the time the rains began. The slash and debris were undoubtedly quite dry as a severe clean burn was the result. Bare mineral soil was exposed, meaning that the duff and humus was burned off and all vegetation was killed save the underground parts of a few species, as

poison oak (*Rhus diversiloba*), hazel brush (*Corylus californica*), etc. The fire was hot enough to kill all the advanced reproduction and even the larger trees that were not cut. The result of burning was that a bare, charred, blackened area was left without vegetation as is shown by the picture.

C. Just what are the chances of securing another stand of Douglas Fir on that area?

There are a number of trees on the ridge above the area and the surrounding country is heavily timbered, but as Mr. Leo A. Issac has shown by his experimental study of the Seed Flight of Douglas Fir, the maximum distance that reproduction is secured by wind-blown seed even following a good seed year is approximately 900 feet from the seed trees. From this you can readily see that it would take a great many years to get reproduction over any great area. The idea that reproduction does better if started on mineral soil is debatable and could not in any event offset the fact that a considerable amount of advance reproduction was left on the area and that seed was also left on the area, had broadcast burning not been used.

The spring following the burn the area was inspected and sample plots laid out in order that study may be made of the area over a period of years. Two types of growth were found growing on the area the following spring; first seedlings, which includes those plants that have sprung from seed that was stored in the soil or that was brought into the area, the former are probably few in number because of the severity of the burn. Of this group the greater majority are annual plants or herbs that give the area little protection either from erosion or by shading the ground. Secondly, there are the vegetative plants, those that have sprung from root and rootstocks left in the ground. During the spring these plants have pushed new shoots up through the burned soil and will no doubt produce scattered clumps of brush or chaparral. The following is a list of the plants found on the area, and the total lack of any reproduction of a commercial species is very obvious.

Scientific Name	Common Name
1. <i>Sinilacina stellata</i>	False Solomon seal
2. <i>Anemone deltoidea</i>	Small wind flower
3. <i>Vicia americana</i>	Vetch
4. <i>Dentaria tenella</i>	Spring beauty
5. <i>Viola glabella</i>	Violet
6. <i>Carduus lanceolatus</i>	Bull thistle
7. <i>Nemophila menziesii</i>	Pale baby blue eyes
8. <i>Senecio vulgaris</i>	Groundsel
9. <i>Funaria</i>	Moss
10. <i>Iris versicolor</i>	Iris
11. <i>Potentilla anserina</i>	Silver green
12. <i>Montia sibirica</i>	Candy flower
13. <i>Cynoglossum grande</i>	Hounds tongue
14. <i>Erythronium giganteum</i>	Dog-toothed violet
15. <i>Dodecatheon hendersonii</i>	Shooting star
16. <i>Trifolium repens</i>	White clover
17. <i>Galium triflorum</i>	Bedstraw
18. <i>Rumex acetosella</i>	Sheep sorrel
19. <i>Collinsia parviflora</i>	Small innocence
20. <i>Trillium ovatum</i>	Wood lily
21. <i>Corallorhiza striata</i>	Orchid or coral root
22. <i>Rubus parviflorous</i>	Thimbleberry
23. <i>Brassica nigra</i>	Mustard
24. <i>Achlys triphylla</i>	Vanilla leaf

The number of plants that survived the burn are very few and are of no commercial value. In a light burn, if they were sufficient in number, they would aid greatly in checking erosion, and in increasing the water holding capacity of the area; however the few that did survive are of no material benefit and will be more of a hindrance than an aid in securing reproduction on the area. The species that lived over and are coming up from roots, rootstocks, and runners creeping in from the side are:

- | | |
|----------------------------------|----------------------|
| 1. <i>Rhus diversiloba</i> | Poison oak |
| 2. <i>Polypodium</i> | Bracken fern |
| 3. <i>Rosa gymnocarpo</i> | Wood rose |
| 4. <i>Corylus californica</i> | Hazel |
| 5. <i>Osmoronia cerasiformis</i> | Indian peach or plum |

Of these the poison oak was by far the most abundant and , as on many burned areas, it showed promise of taking over the area, thus making a serious problem of utilizing the area.

Adjoining the logging operation is the second growth Douglas Fir from which stumpage is being cut, and although it is a dense, pure stand , some advanced reproduction is in evidence, and such undesirable species as poison oak have been shaded out. A small section that had been logged was not burned, but the slash and debris left lying as it had fallen. Besides a number of seed trees on the unburned, logged area, there were numerous seedlings, and some advanced reproduction. The results and effects of leaving the slash on the ground will be discussed later.

Approximately a year after the burn in November 1931, another inspection was made of the area, and the following observations were noted. The annual herbaceous plants were dead, brown and withered, giving the area an appearance of extreme desolation. The dry plants rustled and cracked with every breeze and until the fall rains set in constituted a fire hazard almost as acute as the slash itself would make. The clumps of hazel brush and

similar woody plants had made some growth and the poison oak covered the area to the extent that seedlings coming into the area would have difficulty in competing with the poison oak. There was no reproduction in evidence on the area, which means that regeneration must come from seeding-in on the side which is a painfully slow and questionable process. The trees that were left on the area all died as a result of the fire and many of them have fallen. Erosion has set in to some extent, and with the lack of ground cover will no doubt become worse each year. The area presents a tragic sight of charred remains, blackened trunks, stumps and logs, one year after the burn and prospects for any change for better for many years looks hopeless.

D. Probable Results without Burning.

What would be the chances of reproduction coming in if the area had not been burned over? There was a small area not burned adjacent to the burn and the debris and slash from the logging operations was still on the ground. There were a great many young trees still growing in this area; trees too small to log but old enough to bear prolific crops of cones. Also some reproduction was coming in although much of it was injured in the logging operations. Also as shown in the picture below the slash itself contained a considerable amount of cones which would be quite a factor in reseeding and restocking the area. The humus and debris exposed to the elements by the removal of the mature timber would decay rapidly, making an excellent seedbed for the germination of seed which would be ^{abundantly} supplied if broadcast burning were not used. Summing up the situation it should be very evident that the chances for reproduction on the area would be infinitely increased if the slash were not burned, but left lying on the ground.

The primary purpose of all slash disposal methods is to fire-proof the area or at least to reduce the fire hazard to its lowest possible point. From the archives of the logging industry we note that burning has been the accepted practice of fire-proofing logged areas. Is this the case, does light



Mature Douglas Fir Cones on Fallen Slash

burning life-proof the area? It is certain that if the entire area were burned as clear as on the isolated spots where mineral soil has been exposed and scorched, there would be no further danger of fires, but also future use of the soil would be impractical if not impossible.

However, a clear burn is never obtained and the result is, a mass of charred logs, snags, and vegetation left on the area. Composed mostly of charcoal this charred debris is highly inflammable and the probability of another fire is even greater than though the area had not been burned. Repeated fires run over the area until the soul is bare, eroded and is not capable of producing any crop. What debris does remain is coated with charcoal and is more or less impervious to wood rotting fungi, thus taking longer for the burned wood and slash to decay and form part of the humus of the forest floor, that affects the water holding capacity of the soil and hence controls erosion.

If the area were not burned over the slash and debris would act as a powerful deterrant to the water falling on the hillsides, it would also shade the soil and humus thus allowing it to hold much of the moisture throughout the summer. The soil being protected from the sun and wind would give the seeds, advanced reproduction, and seed trees the necessary nursing to produce another crop on the area, because the soil not robbed of its most essential constituent, humus or organic substance, would be fertile and moist throughout the growing season. Needless to say, the roots of the trees, the undergrowth and the slash itself would practically stop erosion.

How much better, then would it be to spend the money, wasted on burying the slash, on intensive protection. By building a few fire breaks, making trails and perhaps stationing a look-out on the area during the fire season the area would be made much more fire-proof than as if the area were burned over. The dry slash presents a hazard for about four or five years then the reproduction and undergrowth have so completely covered the area that its

fire hazard is very low, much less than that of a burned area. To prevent such a holocaust as Mr. Lamb speaks of or at least to save thousands of acres of our forest land from destruction and deterioration by fire we must turn to the new field of intensive protection and dispose of the slash by some other means than fire.

III. EXPERIMENTS IN SLASH DISPOSAL

A. Priest River Experiment Station

The Priest River experiment station has been delving into the subject of slash disposal for a number of years, and it was mainly through their efforts that the swamper method of slash disposal came into prominence. They have concerned themselves mostly with the slash in the white and yellow pine regions which, though of interest, does not affect the problems we face in the fog belt.

Many other experiments have been conducted along this line, as the Gray's Harbor work on slash disposal, studies at Wind River, Washington, and many other efforts, both private and governmental are being exerted to better the methods of slash disposal.

B. Pacific Northwest Experiment Station

One of the largest studies and undertakings in research work is now in progress at the Pacific Northwest experiment station, at Portland, Oregon. The prupose of the survey is to find out what the tendencies are in slash disposal and what effect the many factors have in getting proper regeneration of the forest. This survey was divided into two parts, collecting the data and preparation of results for publication.

The area used for the study was the Douglas Fir region from the Cascades to the Coast and from Puget Sound to Southern Oregon. This area was divided into types, first the inland Douglas Fir type, which included the territory from the summit of the Cascades to the summit of the Coast range. Secondly the area west of the summit of the Coast range, which was designat-

ed as the wet Douglas Fir type. The third type is destince from the other two although found in some of the same area, and is the spruce type. Sample plots of logged and burned areas were inspected and marked, and data taken on the various factors. Enough plots were observed and measured to give a good representative experiment and the areas were logged and burned recent and back as far as ten years. The logging methods were practically the same for all plots. To give a better idea of the procedure in gathering data and the factors involved the three following forms are included.

SLASH DECAY STUDY

LOCATION..... PLOT NO.....

EXAM BY.....NOTES BY.....DATE.....

[illegible]

Notes:- ...

SLASH DECAY STUDY

LOCATION..... PLOT NO.....

EXAM BY _____ NOTES BY _____ DATE _____

[illegible]

Notes:-

SLASH DECAY STUDY

TYPE _____ PLOT NO. _____
 LOCATION _____ DATE _____
 LOGGED BY _____ EXAM BY _____ NOTES BY _____

ORIGINAL STAND				WHEN LOGGED _____	SEASON _____
Sp	No %	Vol %	Stump diam		
				METHOD _____	
				SOIL _____	
				SLOPE _____	
				EXPOSURE _____	
				BURNED _____	

SLASH				GROUND COVER				Gen. Charac	NOTES
% Ground Covered	Species	Percent	Vol % of large material	% Ground Covered	Species	Height	Percent		

Class of Material	SPECIES	BARK					SPOROPHORES			
		% Knocked off	% Burned off	% Sloughed off	% Loose	% Tight	Degree of Occur.	Fungus %		
TOPS AND SMALL LOGS										
LARGE LOGS										

Notes: ..

Each one of these forms is made out in the field while the measurements are being taken, and there are three for each plot examined. This work was carried on over a period of a couple of years so that a considerable volume of data was obtained.

Unfortunately, the data has not all been assimilated and recorded so that the results of the survey have not as yet gone to press, and the results are not ready for publication. In a conference with Mr. Thomas Childs who was in charge of gathering the field data I was able to learn of a few tendencies that the field data showed. The first was that the unburned areas produced a heavy growth of brush, chaparral and reproduction soon after the area was logged, making a canopy which keeps the slash and debris moist and cool, thus keeping the fire hazard low. This also gives fungi a chance to work in the slash and decay it, which is highly desirable. Also the wood rotting fungi on the unburned plots were found to be the wet-wood rots that keep a high moisture content in the hosts, while in a burned area the wet-wood fungi is supplanted by the dry-wood rots.

The burning of the slash reduces the immediate fire danger but the hazard becomes greater after the first couple of years while in the unburned area the hazard, while accentuated the first year or two, gradually becomes minimized to a lower degree than burning could possibly make it. These tendencies are my own observations in looking over some of the field data at the Portland station, and I feel sure that with the publication of the report the public and particularly the men in the forestry industry, whether it be logging, manufacturing or as technical foresters, will realize the damage and danger of slash burning.

*** CONCLUSION ***I. FULFILLMENT OF OBJECT

A. Importance of the Problem

It would be superfluous for me to say that you, who are about to go out into the field of forestry as professionally trained men, are interested in this problem which is vital to the whole of the forestry industry. Also, many of the most prominent men in private as well as governmental work have been putting forth their efforts for some years to try to find the answer to the slash disposal question. As the years go by and the remaining forest areas become smaller and stumpage depleted this question will become even more pertinent.

B. Enforcement of Regulations

I hope that I have drawn attention to the inadequacies of our present legislation concerning slash disposal. The fundamental principles upon which the laws are based are unsound and the enforcement of them as they now exist is worse than no enforcement. When constructive, sound legislation has been in^aaugurated, strict enforcement is necessary if we are to accomplish the objective of forestry, that is to keep the forests on a sustained yield basis.

At the end of every summer as we look over the reports of the great many acres, the thousands of board feet and property destroyed and devastated we cannot help but feel that better forest protection must come if we are to preserve the industry. The greatest development has been along the lines of fire protection and when slash burning has been eliminated or controlled, a great step will have been taken toward to solution of the slash disposal question.

II. SOLUTION OF THE PROBLEM.

It has not been proven that burning of the slash is entirely detrimental and as long as the general public and men in the industry believe that burning is the best policy little progress can be made. A general re-adjustment of ideas on the subject is necessary to bring about the surrender of old practices. With the ever increasing amount of knowledge and data on this question the prospects look bright for advancement in slash disposal policies, and as interest continues to grow the perils of present methods should become less acute.

Intensive utilization would automatically eliminate the slash disposal question, as it has in European countries, but we cannot sit idle and wait till the time when we shall be utilizing all of the tree, but must do all in our power to find a way to alleviate the existing situations.

The two following pictures were taken on the Soap Creek operations, ~~and~~ figure one shows⁹ the burned over area, in which broadcast burning was used in the usual way. You can readily see how desolated, bare and repulsive the area is after the fire has swept over it. Figure two shows the unburned plot with the slash, standing trees and stumps not blackened and charred by fire. It is easy to see how much more protected the soul is in the unburned area in comparison with the burned. If I have aroused your interest in this subject and have opened your eyes and minds, to some of the facts, problems and emensities of the problem of slash disposal, I shall feel fully repaid for my efforts in gathering the data and setting down my observations and conclusions.



Results of Broadcast Burning



Charred Logs and Scorched Soil



Slash as Left on the Ground

*** REFERENCES ***

- F.H. Lamb, Legalized Forest Destruction.
Timberman, Page 49, 1925
- F.H. Lamb, To Burn or Not to Burn.
Timberman, November 1925
- L.D. Blodgett, Slash Disposal on Steep Slopes in the Douglas Fir
Slopes in the Douglas Fir Type.
Forest Worker, Page 12, May 1929
- G.C. Joy, Comments on "To Burn or Not to Burn".
Timberman, November 1925
- E.T. Allen, A Discussion of Fires and Logged-Off Lands.
Timberman, December 1926
- T.T. Munger and G.L. Drake, Snags.
Timberman, December 1926
- F.E. Pape, West Coast Lumberman
Page 38, March 15, 1922
- J. Sutherland, Four-L Lumber News
Page 16, May 1926
- J.E. Patterson, The Relation of Highway Slash to Infestations by
White Pine Beetle in Standing Timber.
U.S.D.A. Technical Bulletin, Number 5
- Relation of Insects to Slash Disposal.
U.S.D.A. Bureau of Entomology
Department Circular, Number 411
- Demmon, Fires and Forest Growth.
American Forests
35:273-6, May 1929
- R.D. Hall, Keep Out Fires--Nature Will Do the Rest
Coal Age
34:351-2, June 1929
- J.A. Larsen, Study of Natural Reproduction on Burned Forest Areas.
Int. R. Ag.
19:901-2, October 1928

A.M. Muller, Destructive Fires in Western Oregon.
Paper, 35:414-15, December 25, 1924

W.J. Perry, Those Harmless Surface Fires.
American Forests,
32:536-8, September 1926

J.S. Boyce, Decay and Seed Trees in the Douglas Fir Region.
Journal of Forestry
25:835-9, November 1927

J. Roeser, Study of Douglas Fir Reproduction Under Various Cutting
Methods.
Journal of Agriculture Research
28: June 21, 1924

H.E. Hoefner, Some Slash Disposal Observations in the Douglas
Fir Belt.
Journal of Forestry
25: 560-3, May 1927