The Tillamook Burn and the Problems Confronting It.

by

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A Thesis
Presented to the Faculty
of the
School of Forestry
Oregon State College

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Science
June 1939

Approved

... Professor of Forestry...
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The purpose of this thesis is to study the Tillamook burn from the ownership and management phase. After every large fire the question comes up as to what to do with the burned over land. Usually nothing is done about it. The same thing has happened to the Tillamook burn. People know that something should be done, but nobody wants to take the initial steps to bring this area of land back into a productive state.

In this thesis I will bring out some of the problems and possibilities of bringing this area of land under intelligent management and ownership, so that the land can be returned to the same highly productive state which it was before the fire.

This problem is very important to the people of the Northwest as the forest products furnish jobs for over one-third of the people in the region. When there is a large fire the number of jobs in the region decrease, and the tax burden is shifted to a smaller proportion of the people. If these burned over lands are not put back into a productive state there will be no income from these lands. They will be idle and useless to the people of Oregon. The value of the forest products lost because of the Tillamook burn is estimated at between $200,000,000 and $375,000,000. This is only the monetary loss and does not include the loss due to no growth on the area each year or the loss of game and other forms of wild
life. The aesthetic value of the land before it was burned is inmeasurable, and as this area is readily accessible to the public the loss is very high.

The procedure I used in tackling this problem was to find out all I could about the burn. There is actually very little printed material about it. After finding out the cause, size, and description of it, I found out that the only other information about it was the reproduction studies carried on by Leo Isaac of the Northwest Experiment Station in Portland. I went to this experiment station in Portland and went through their library. I secured a copy of the reproduction studies from the Librarian. I then went and talked to W. G. Morris who is in charge of fire control for this region, and he gave me his manuscript report of "The details of the Tillamook fire from its origin to the salvage of the killed timber." The technical data and charts that I have about the fire were taken from this report. I then went and talked to Mr. Leo A. Isaac and got his own personal views as to what should be done with the Tillamook burn. Mr. Isaac's views and ideas are incorporated into this report along with those of Mr. Lynn Cronemiller who was State Forester at the time of the fire. Mr. Cronemiller gave me some very interesting information from the State Forestry angle. From the combined infor-
mation of these two men I have bases my own conclusions as to what should be done with the burn. I think that these men have furnished me with the best information along these lines which could be had as both of these men know the problems of forestry, and they have advanced far enough in their professions to be considered experts.

The first part of this report deals with the cause, size, and loss due to the fire. Also the condition of the burned over area as to reproduction and conditions of the ground cover.

The second part of this report deals with the problem of who should administer this area of land so that it can be brought back into a productive condition.
The Tillamook fire started on the afternoon of August 14th. That morning a brisk Northeast wind whipped through the area. By noon the humidity was so low and the fire hazard was so great that the operations ceased for the day. That is all but one operator who decided to stay open a while longer. It was this last operation which was the cause of the fire. It started through friction caused by logs being dragged on the tinder dry ground. The fire quickly spread to adjoining slash and was soon out of control.

In the next eleven days the fire developed into the most destructive fire that has occurred in Oregon in the last sixty-five years. The fire lines were continually won and lost. Time after time the fire was thought to be under control, but it always seemed to get away due to the dry east wind that never ceased blowing. Aviators flying over the fire estimated that the smoke columns reached a height of forty thousand feet. The wind was so terrific that the aviators refused to take their planes near the fire fearing that they would be drawn into the flames. Towns all over Western Oregon became overcast with smoke. Many cities had to turn on the street lights as a dense darkness engulfed this part of the country. Even the chickens
Figure 1. Approximate boundary of Tillamook Burn, showing spread of fire during successive periods, centers of work, and survey lines run.

**Work Centers**

1. Reeher's station  
2. Trask Willamette camp  
3. Trask CCC Camp  
4. Harris patrol station  
5. Smith place station  
6. Hammond-Whitney Camp  
7. Nehalem CCC Camp
went to roost. On the day of August 24th, the fire started crowning and inside of twenty-four hours the fire had grown from 40,000 acres to an approximate 290,000 acres.

On August 26th, the wind shifted and the fire was put under control and was at last put out.

This fire had spread over approximately 280 square miles of highly productive lands and killed 14 billion board feet of timber. It covered the main watersheds of the Trask, Wilson, and Kilchis rivers and portions of the Miami, Nehalem, Tualitin and Yamhill rivers. The elevation of the burned over area varies from 50 feet above sea level at the western edge to more than 2,000 feet at the summit of the coast range. The entire area is well-drained and is cut up by a great many steep ridges that run in a general East-West direction.

Most of the area was occupied by Douglas fir forest type. The stand was dominated by old-growth Douglas fir and Western hemlock, and contained a scattering of Lowland white fir. On the western edge where the Douglas fir merged with the Spruce-hemlock type of the coast, Sitka spruce and Western hemlock composed a large proportion of the stand.

Conditions on the area varied greatly after the fire. Percentages of the ground covered by surface vegetation
Species | Per cents
--- | ---
Douglas fir | 82
Western hemlock | 15
Western red cedar | 02
Other species | 01

The above chart will show the percents of the different species in the burn.

<table>
<thead>
<tr>
<th>Site</th>
<th>Acres</th>
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<tbody>
<tr>
<td>L.</td>
<td>11,804</td>
</tr>
<tr>
<td>II.</td>
<td>385,450</td>
</tr>
<tr>
<td>III.</td>
<td>193,674</td>
</tr>
<tr>
<td>IV.</td>
<td>28,541</td>
</tr>
<tr>
<td>V.</td>
<td>13,003</td>
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The above chart shows the number of acres of the sites for Tillamook county.
<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coniferous timber over 20&quot; in diameter</td>
<td>76.5%</td>
</tr>
<tr>
<td>Second growth under 20&quot; in diameter</td>
<td>16.0%</td>
</tr>
<tr>
<td>Deforested burn (from previous fires)</td>
<td>1.3%</td>
</tr>
<tr>
<td>Recent cutovers (logged before 1920)</td>
<td>2.7%</td>
</tr>
<tr>
<td>Non-stocked cutovers (logged before 1920)</td>
<td>2.2%</td>
</tr>
<tr>
<td>Hardwoods</td>
<td>0.8%</td>
</tr>
<tr>
<td>Farmlands</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

The above chart will show the composition of the stand as to types.
varies from 0 to 100%. On some of the steep Southern slopes that were severely burned, the cover is very light. In contrast, the vegetation on the many moist bottoms and Northern slopes was not completely destroyed by fire and supports a luxuriant vegetation and is very dense. On the average, the per-cent of soil surface covered by vegetation has increased from 55% to 70% in 1937. This increase however, has resulted in less favorable seedbed conditions than were prevalent two years before. Extensive portions now have such a heavy cover that tree seedlings must withstand severe competition to germinate and survive.

Fireweed is predominant of the ground cover species, Senecio and low peavine, both of which were widespread immediately after the fire, have lost ground to perennial plants such as oxalis, oregon grape, vine maple, blackberry, swordfern, elderberry, and thimbleberry. Bracken which often makes its appearance on cutover lands is gradually appearing and will probably increase, particularly on areas reburned after salvage operations.

The 1935 reproduction studies disclosed that, except for the Cedar Butte double burn, there were few large areas entirely devoid of seed trees. Green trees were numerous as individual trees, in groups, and on unburned islands. They were found in the greatest
numbers in the Northeastern corner of the burn, where the fire moved slowly, but were also scattered sparingly throughout the Southern and Western portions. The green islands naturally contain a mixture of all species present before the fire, but the single green trees were dying. An investigation at the time by the bureau of entomology disclosed that a large number of living firs within and bordering the burn were being attacked and killed by the Douglas fir beetle. A great quantity of breeding material has been made available to this beetle by this fire. Since the beetle does not usually attack trees that have been dead for more than a year, the large adult population in the spring of 1935 attacked the green trees on the burn and the green trees around its edges. This outbreak has largely subsided since 1935, but it undoubtly caused the death of a large number of Douglas fir seed trees. Many of the remaining trees are succumbing to fire injury, change in exposure, beetle attack, or a combination of these causes. It is expected that a large annual loss of seed trees will occur for a number of years. The green trees remaining on the burn and the trees at the border now provide the only source of seed for additional reproduction on the burn. As many of them gradually die, the seed supply will proportionally diminish.
That fire hazard on the Tillamook burn is severe was recognized immediately after the fire by the State Protective Agencies. Since that time the area has been closed to entry during the fire season as a precautionary measure, and improvements have been made to reduce the fire hazard. The fire left many snags standing on almost all parts of the area with a fairly large amount of unburned material on the ground.

Throughout the burn, many of the fire-killed trees are beginning to shed large quantities of bark and limbs. As would be expected, this deterioration seems to be progressing more rapidly with hemlock than with Douglas fir. On some areas the tops of many of the dead trees have broken out and fallen to the ground; on other areas, noticeably near the Western edge of the burn, many of the hemlock snags have been windthrow. Consequently, a large amount of inflammable material is constantly being added to the surface debris. Moreover, after the snags shed their bark, the sapwood weathers and dries and becomes exceedingly inflammable at nearly all seasons of the year. These changes in intensify an already severe fire-hazard condition which will remain unabated until logging enters the picture or until a new stand is well enough established to hasten decay of the snags and debris.
and to shade out the inflammable vegetation. A study by Mc Ardle in 1931 showed that if a Douglas fir area restocks promptly and abundantly following a crown fire, the large trees of the new forest crop overtop most of the deteriorating snags about 35 years after the fire. At present, the severe fire hazard offers by far the greatest menace to natural reproduction.

New roads and trails have greatly improved facilities for transportation onto the area, and logging operations are helping to form effective firebreaks through portions of the burn. With the completion of the roads and trails now under construction and the continuation of salvage logging, much of the burned area will soon be readily accessible, so that, should a fire start, it would be possible at least to reach it promptly and probably prevent it from spreading throughout the area.

In reproduction studies made in 1937, it was found that most of the reproduction was three or four years old, that is, had become established in the two years immediately following the fire, 1934 and 1935. Comparatively few seedlings have germinated and established themselves since 1935. This is probably the natural result of a diminishing number of seed trees, coupled with less favorable seedbed conditions
FIGURE 2

LEGEND

TILLAMOOK FIRE BOUNDARY
AREAS FULLY STOCKED
AREAS PARTIALLY STOCKED
AREAS NON-STOCKED
AREAS NOT STOCKED
AREAS LOGGED 1925 TO 1937
that have been created by an increase in competing vegetation. Although a light ground cover is favorable to seedling survival, the heavy cover that is now typical offers severe competition to the new seedlings.

In general, the distribution of tree seedling is about the same now as in 1935. The density, however, has decreased slightly on the area. On the average, the proportion of fully stocked area is now only 19%, as compared with 27% in 1935, and the proportion of non-stocked has increased from 44% to 53%. The proportion of partially stocked area has remained about the same.

There has been no significant changes in species composition. There has been a slight increase however, in cedar and spruce; hemlock still constitutes the same proportion.

Since the fire about 50,000 acres of land within the burn has been cutover. In general, the salvage operations have been followed by broadcast burning. Along with the usable Douglas fir snags, many of the remaining green trees have been cut. The fire-killed hemlocks are not being utilized, and many remain standing along with the merchantable Douglas fir snags. Naturally, the logging does considerable damage to the
reproduction on the ground and the subsequent slash fire destroys practically all the remaining seedlings. Logging followed by broadcast burning temporarily lessens the fire hazard, leaving large areas reasonably free of snags and with only a small amount of inflammable material on the ground. It again denudes the areas, however, and leaves them with inadequate seed supply for natural regeneration. Planting or artificial seeding would be necessary to put these areas back into production.

To summarize the reproduction condition on the burn the following trends are noticed.

The density of the surface vegetation has on the average increased from 55% to about 70% in 1937.

Green trees and patches are still numerous, but many of them were killed by the beetle infestation of 1935 and their numbers are constantly diminishing from fire injury, change in exposure, and insect attack.

A slight decrease in stocking was apparent on all of the areas reexamined. Few new seedlings have become established since 1935, probably owing to a diminishing seed supply and an increase in amount of competing vegetation. The addition of new reproduction has been more than offset by mortality of other seed-
lings. However, the older seedlings are now well established. In general, the Northern section of the burn is still well-stocked, and the Southern and Western portions remain rather poorly stocked. Restocking conditions on the area already cutover before the fire and on the Cedar Butte double burn were not checked in recent examinations, but it is assumed that the areas are as poorly stocked as they were in 1935 when they were last checked.

Salvage logging operations have lessened the fire hazard, by removing most of the snags on the areas logged. As would be expected, however, logging followed by broadcast burning is destroying practically all of the established reproduction on areas so treated and leaving them with an inadequate seed supply for future natural regeneration.

Planting or artificial seeding would probably be necessary to put many of the non-stocked areas back into forest production.

The shedding of large quantities of bark and limbs from the fire-killed trees is gradually increasing the amount of inflammable material on the ground and is leaving the snags in a more inflammable condition. The great number of snags and widespread accumulation of surface debris combine to form a fire hazard that is
by far the greatest obstacle to the regeneration of this highly productive area.

The next thing to consider is who should own this area or manage it so that it can properly be protected and brought back into productivity. The private owners now constitute the major portion of the landholders in this area. Although these private owners are not paying taxes on the burned-over land, they still own it as the county has not yet taken over the land. Although there is a lot of talk about the private timber holders' moral obligations to keep the land in a productive state, they are not going to do so if they are not going to make any money out of it.

Mr. Cronemiller stated that there is no possible way for the private timber owner to make a profit on the Tillamook burn. He said that even using your formula's for determining the worth of forest property to infinity, could you show a profit for this area. I have no evidence to back up this statement, but assuming that it is true or even partially true, the private timber holder would be foolish to hold on to the property if he is out to make profits.

The next agency to consider is the county. Tillamook county has most of the burned over area within
its borders. In fact 40% of the tax base of Tillamook county was destroyed by the fire.

We have had very little experience with county forests in the West. About the only place where there has been county forests at all is in the East. These are fairly small and would not begin to compare in size to the Tillamook burn. In the whole United States there is only a total area of approximately 650,000 acres of strictly county forests. Most all of these forests are less than 500 acres in size.

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<td>Private</td>
<td>165,838</td>
<td>30,169</td>
<td>1,790</td>
<td>12,932</td>
<td>420</td>
<td></td>
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<td>County</td>
<td>4,436</td>
<td>21,429</td>
<td>565</td>
<td>2,940</td>
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<td>1,471</td>
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The above chart shows the areas in acres burned in the Tillamook fire by class of forest cover and ownership.

The state planning board made the following statement in their annual report to the Governor of Oregon: "Cutover and burned over lands are rapidly..."
moving into county ownership. State planning recommends that the state acquire these lands from the county either by purchase of the tax equity or for administration in behalf of the counties. The lands then could be blocked up into state forests which could be efficiently managed."

Therefore we can safely say that the county is not the agency to administer the Tillamook burn. It has neither the funds or the organization to carry out such a program.

The next agency that could possibly manage the area would be the State in the form of a State Forest. When I talked to Mr. Leo Isaac he made the statement that it was too big of project for the states to handle. He said that they did not have adequate funds to properly manage such an area as the Tillamook burn which has such a high fire hazard.

On the other hand Mr. Cronemiller who was State forester at the time of the fire says that the state is the agency to manage and protect the area. He pointed out that the Federal government already owns 57% of Oregon in the form of National Forests and other such agencies. If this is kept up he said that it won't be long before most all of Oregon will be under National
Government proprietorship.

Mr. C. J. Buck who was until recently regional forester for this region made the statement in a report that the National Forests cannot be expected to absorb cutover and burned over lands. Much of it is too far from the National Forests, and in any case, it is not expected that the present forest boundaries will be appreciably extended.

So, herein lies the opportunity, if not the obligation of the State, to acquire such lands, consolidate them, and manage them for permanent forest production. The State now has but 70,000 acres of such forest lands. There is ample room and ample financial responsibility for the three agencies—Federal, State, and private in keeping Oregon's forest acres at work.

The State Planning Board in a report in relation to State ownership of cutover and burned over lands stated that at present the State of Oregon has but one State Forest which comprises about 70,000 acres. It holds and additional 80,000 acres in scattered tracts which are chiefly suited for Forest purposes, but as yet not so dedicated and managed. As previously stated, large areas of cutover and burned over lands are on their way
into county ownership via tax delinquency. These areas should ultimately come under State Forest administration. On other areas of second growth now threatened with premature liquidation should also pass into public ownership to relieve pressure and prevent wasteful cutting. There are also bodies of first and second rank timber which private enterprise cannot continue to hold. All of these areas which cannot now produce a return sufficient to justify the owner in retaining them, could and should become State Forests. When once established and properly managed, these lands will begin to yield a permanent revenue to the State and counties. Unless these areas are placed under some public ownership, it appears that the only other alternative is a no-man's-land of unprotected areas which becomes a fire menace to all other timber.

The natural thought is why should the counties give up this land to the State or National Government? In a report by J. C. Buck, a survey was made of the National Forests of this region. It was found that the counties receive one and three quarters million dollars a year from National Forests in the form of timber, roads open to the public, permits to graze and other
such things. Taxes from these same lands would amount to one million four-hundred and sixty-eight thousand dollars if the government didn't own the property. This shows that the counties are not losing money in the form of taxes from some Government agency when the agencies take over the lands for management.

In conclusion I would like to say that I think that the State is the proper agency to manage and protect the Tillamook burn. There is some opinion that the National Government should take over the area because it would administer the area more efficiently. The State also has a protective force and means to properly manage the area. If the National Government started taking over areas like the Tillamook burn, the State of Oregon would soon be mostly under Government ownership. It is believed that the National Government already owns too much land in Oregon by many people. I believe that there should be a more even distribution in ownership of forest lands. Areas like the Tillamook burn will give the State a chance to acquire more lands to manage, put into and keep in a productive condition. It is the State's responsibility and should be accepted by her.

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Bibliography


This is a picture of the Tillamook burn taken from the summit of Cedar Butte and looks directly North.