Restocking the Tillamook Burn

by

Lee Ritter

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AN INTRODUCTION TO THE TILLAMOOK BURN

The 300,000 acre tract of burned over land located eight miles west of the city of Tillamook, Oregon, is known as the Tillamook Burn. Actually, the area is three burns, since three fires occurred on roughly the same area during the last fourteen years. The first and most destructive fire covered approximately 257,000 acres and destroyed ten billion board feet of timber that was two-thirds virgin growth. The stumpage loss alone amounted to $20,000,000 and the total cash loss was estimated to reach the sum of $350,000,000 (1). It is appalling to note that timber losses were equal to the national cut of timber for the preceeding year (1932) or nine times the normal annual cut in the Douglas-fir region. Tangible fire losses from the second and third fires include reproduction which became established after the initial loss, as well as additional losses in standing and bucked timber necessary to swell the size of the area to an ash-covered 300,000 acres.

Geographically speaking, the Tillamook Burn is located in the counties of Tillamook, Yamhill, and Washington. Although much of western Washington

county was destroyed and a portion of northwestern Yamhill county was ravaged, it is only fair to point out the obvious fact that Tillamook county absorbed a lion's portion of the damage. A part of the tax base of that county was removed and the economy upset temporarily in the shift in ownership patterns from private to state.

Physical and climatic factors include 120 inches of rainfall yearly plus elevations varying from 100 to 3,700 feet. The topography of the area is exceedingly rough, with steep canyons formed by the Nehalem, Kilchis, Trask, Miami, and Wilson rivers. The burn features the steep slopes and sharp ridges for which the Coast Range is famed, although no abrupt peaks are present as they occur in Oregon's striking Cascade Mountains.

In the main, cover exists in the forms of trees and brush. Almost five million snags stand in the burn, while unburned trees are to be found in singles or very small seed blocks. Many old growth trees around the periphery were attacked and killed by the Douglas fir beetle found on every burned acre in the Pacific Northwest. This insect damage added to the grief of the owners of forest lands in the area, since the dead trees created a fire hazard and demanded removal in the early months following the

attacks. Fireweed, swordfern, and salal cover a large part of the understory and share the rather crowded soil with thimbleberry, bracken fern, vine maple, blackberry, and Oregon grape. Grass and weeds, flourishing between partially-burned stumps and decaying logs on the ground, serve to complete the picture.

The ownership setup in the burn is an interesting one. Before the 1945 fire, the state owned one-half of the land while private owners claimed the remaining sections. The Forest Service later sensed an opportunity to add to its extensive holdings in Oregon and made an effort to purchase as much of the burn as was available. The state wished to add to its ownership some of the finest timber-producing sections in the northwest and objected to any sale to the government on the ground that the United States already owned 56% of Oregon. Private interests were concerned only with salvage and disposal of their holdings at a later date, since it is not economically feasible for a private company to reestablish and manage a forest in view of the existing situation. As an end result, the state owns almost all of the burn at present and expects to obtain the additional acres necessary to make the land the property of the state.

According to Tillamook county officials, the land is roughly 60% Site Index II and 30% Site Index III.

The following table was based upon statistical information pertaining to the county of Tillamook but is typical of adjoining Washington and Yamhill.

Site Index	Area in Acres
I	11,804
II	385,450
III	193,674
IV	28,541
V	13,003

Table 1--Site Index Classification of Tillamook County, Oregon, according to acreage.

Upon reading an introduction to the Tillamook burn, the typical forester is immediately made aware of the seriousness of the problem as it exists. Hundreds of skilled foresters have passed through the area and dozens of suggestions and plans have been studied; to date, however, all plans are in an experimental stage and little information has been divulged by the state office. Statistical information is almost nonexistent.

The bibliography of this thesis contains in part articles written before the 1945 fire; the current situation was noted and studied by the author over a period of two summers spent in the burn with state and private organizations.

NATURAL REPRODUCTION

Species	Percent
Douglas fir	82
Western hemlock	15
Western red cedar	2
Sitka spruce, Port Orford cedar, and other species	1

Table 2--Original timber cover of the Tillamook burn by species and percent.

In its natural state, the area was covered by a variety of species. The table above indicates those major species present and includes the percent which is their contribution to the total original timber cover.

In the reproduction present after the first two fires, there appeared to be little change in relative numbers of Douglas fir and hemlock but Sitka spruce and western red cedar seedlings evidenced a slight increase. The amount of reproduction now present on the Tillamook burn is so small as to be almost insignificant. Although isolated seed trees and blocks are present in some portions, the mortality rate due to fire and insect damage is so high that only a few of the trees will live another five years.

Unusually young trees were found to produce seed cones on the burn; several trees in a block of trees averaging sixteen years of age bore seed and one small speciman of six years carried a fully-developed cone.

Virgin stands adjacent to the burn are an excellent source of seed, and some reproduction is becoming established around the outskirts of those stands. Stimson's Island and the Jordan Creek block are perfect examples of such stands. The obvious disadvantage of such a situation lies in the fact that it is next to impossible to seed such a large area from its fringes. In addition, the Douglas fir bark beetle killed ¼-billion board feet of timber around the burn, thus destroying many unformed seedlings.

Of all the factors known to influence the establishment of seedlings, mortality among seedlings in the Tillamook burn is expected to occur because of irregularities in temperature, soil moisture content, and exposure. Since seedlings in the burn must be established under adverse circumstances, low survival rates must be expected. Leo Isaac is of the opinion that only one seedling out of ten will live under such severe site conditions. Observations show large areas in which the soil is deeply burned. Small rocks are fused together in the charred soil, and slides plus

erosion serve to complicate the site problem.

It is logical to assume that high costs will be encountered when the area is restocked.

COSTS OF RESTOCKING

It is estimated that the cost of restocking the Tillamook burn will exceed $750,000 per year. (2) This cost includes the actual planting activities as well as the costs of organization, transportation, and supply service. There will be little if any difficulty in obtaining a supply of labor, but transportation costs will be unusually high because the network of roads through and near the burn is not sufficiently developed to allow entry into isolated areas in the center of the burn. The steep ridges and deep canyons will make necessary the use of pack animals provided the plan adopted calls for partial planting by hand methods.

Since fire protection is vital, costs due to the construction of fire breaks (in the form of corridors along the summit of the Coast Range and on strategic ridges) were included in the original estimate. It was discovered that to fell all snags and plant every acre of the burn would result in costs which might be prohibitive; some of the snags, however, must be taken out if an effective firebreak system is to be included in the protection of the area.

In one of the original plans for the fire protection of the burn, a suggestion was made which might prove valuable. According to plan, the burn area would be divided into five parts, each containing approximately the same number of acres. This is made possible by natural breaks in topography formed by ridges and rivers. The actual dividing line was a firebreak roughly one-fourth of a mile wide which according to the plan would be a corridor resulting from the removal of snags.

Planting operations in such a case probably would involve skeleton planting on ridges and sheltered slopes in order to establish a seed source for seeding the remaining acres. If this were to be the case, a time limit of approximately ten years is deemed sufficient for the establishment of reproduction. The estimate, then, considers total costs of roughly $7,500,000.

State officials have encountered much objection to any plan involving considerably large financial sums. It was suggested that a priority system be set up to determine planting order of various areas.(3) Why spend large sums of money on a sea of snags waiting for the spark when lands of very little fire risk need planting? Areas under treatment could be listed in order of priority as determined by such factors as

productive capacity, fire risk, and attitude of ownership.

Of course it is impossible to undertake so large a project without tremendously high costs; it is for this reason that the state or some other public agency is the logical choice for the task.

SPECIES TO BE USED

Although experimental plots are planted with trees not native to northwestern Oregon, native species were selected as being most likely to survive under existing conditions. The species used, then, would include Douglas fir, western hemlock, western red cedar, and sitka spruce, since those species were found on the area before the burn and in reproduction after the 1933 fire.

Douglas fir occupied 82% of the site, as noted in Table 2, but seldom occurred in pure stands. Hemlock, spruce, and cedar trees were found in the fir stands in combinations varying with elevation. Hemlock, it was found, tends to avoid the ridges and seems to prefer the lower levels of the western slope of the Coast Range. Small, relatively pure stands of hemlock were found on the sheltered watershed areas near the summit ridge but were not present on the ridge proper. Spruce, of course, was noted only at the lowest elevations.

Two percent of the original cover was western red cedar in the form of widely scattered groups of a dozen trees each. Since cedar does not grow readily above 3,500 feet, the planting of this species should be restricted to the moist lowlands near the coast. Cedar does not produce its best growth in pure stands, and for this reason should be planted in mixed stands of Douglas fir and hemlock.

The Tillamook burn is located in the most productive portion of the Douglas-fir region, as the reader is aware; it is logical, then, that Douglas fir is selected as the ideal tree to be used in any restocking program applied in the immediate area of the burn. Furthermore, it is anticipated that the mortality rate among Douglas fir seedlings will be less than that of other species used. The choice is made more logical when the economics of growth on the burn are considered. Before the burn, the growth rate of Douglas fir was 750 board feet per acre per year; the growth rate of any of the other species growing adjacent to these fir stands was less and the value of the lumber on the market lower than fir values.

Perhaps it would be wise to increase the percent of Douglas fir to ninety or more when restocking this soil.

In keeping with the best practices of good seed selection, cones should be collected within one hundred miles of the burn and from an area having approximately the same elevation as the average on the area to be seeded.

SEEDING BY HAND

New methods of planting, including the use of the Miller planter for seedlings and the seed gun for free seeds, have been developed in the last five years. (4)

The Miller tree planter, invented by Sam Miller at the State Forester's office in Oregon, has had a tremendous effect upon hand methods of planting forest species. Its use will result in an increase in the number of seedlings planted per day by each man to the extent than an unskilled individual might plant two hundred trees per hour. Formerly, a man planting by means of a hoe might plant one-third as many trees. Obviously, the speed with which trees may be planted will have an important bearing upon expenses involved in the actual planting operation.

Of particular import are the mortality rates of seedlings planted by the Miller method. Survival percentages are noticeably greater when the tool is used; the expected rate is ninety-five living seedlings out of a possible one hundred. The major

disadvantage of the Miller tool lies in the fact that the roots of each seedling must be wrapped with paper napkins and peat moss in order to insure such survival. The success of this method is due to the exclusion of air pockets from the root system of the seedling. Drying, therefore, is avoided entirely or held to a bare minimum.

Because of the speed of the planting operation, labor costs due to planting have been cut in half by the Miller machine. On the other hand, labor costs must be increased during the wrapping in paper napkins and peat moss because this operation will require additional workers. The problem of wrapping quickly and inexpensively is yet to be solved.

The chief virtue of the direct seeding gun lies in the fact that the seed is planted in the ground and is less liable to suffer the attacks of exposure, rodents, and drying from lack of soil moisture content.

Both machines are fitted for use in the Tillamook burn area.

If hand planting methods are used, seeding undoubtedly will begin on the eastern edge of the burn because of the great fire danger on that fringe.

SEEDING FROM THE AIR

In seeding such a huge area, aerial seeding methods could very easily be employed. Although seeding from airplanes and helicopters is in an experimental stage as this thesis is written, enough evidence is available to point out the peculiarities and advantages of the system.

Recent tests on O & C lands involved the planting of Port Orford white cedar to the extent of 217 pounds per acre. This seed, which averaged 40,000 seeds per acre or roughly one seed per square foot, depends upon its natural oils to protect against rodent attacks.

The Crown Zellerbach Corporation planted one thousand acres by helicopter in an experiment designed to find the effectiveness of such a method in Columbia county, northwestern Oregon. Four hours were required to plant the area, and it was estimated that planting a comparable area by hand would have involved five-hundred man-days of labor. The cost of the seed plus flagging the area plus flying brought the total figure to $12-$15 per acre. In a part of the experiment, bare seed was used. The problem will be to determine how many of the seeds which did not germinate were eaten by rodents. Columbia and Tillamook counties suffer alike from tremendous rodent populations. Chipmunks, ground

squirrels, shrews, and mice devour seeds the instant they are discovered.

To combat the rodent situation--or at least to sidestep it--Crown included in its experimental plots several areas seeded with pelleted seeds. The particular seed which they were using was developed by The Filtrol Corporation, in Los Angeles, California. Sitka spruce seeds were being used, and the finished pellet weighed five times as much as bare seed. The pellets contain Arosan, a combination repellent-fungicide developed by the Army during World War II. In addition, a hormone booster was added to the mud coating on the seed in order to insure proper development of the seedling in the early days of its bewildered life. The price of spruce pellets was $8 per pound.

The advantages of seeding from the air are many. Quick to appeal to the forester are the low costs involved and the short period of time consumed in the seeding operation. Seed pellets, by virtue of their shpae, fall and roll their way through the brush cover and come to rest near or on the mineral earth. Areas inaccessible by other means may be seeded from the hovering helicopter.

Of course the method is not without disadvantages.

The survival rate is less than that of planted areas because the rodent population present very quickly begins its work of destruction. The chance that seeds might fall in an area of unfavorable conditions is not to be ignored, nor is the obvious fact that more seeds will be required in order to establish the necessary number of seedlings per acre.

Snow is expected to enhance germination and survival and it is possible that seeds dropped in the late winter or early spring might land in snow and develop without fear of excessively high rodent damage. The burn is covered with snow during the winter months.

Tolerance of species must be considered in computing germination and survival rates, since such tolerant species as the hemlock might germinate and grow on a site not suited for the less-tolerant Douglas fir.

SEED AND SEEDLING PROTECTION

It was found that the success or failure of a seedling depends upon the first few years of its existence. When the seed is deposited, there is danger of rodent attack, attack by birds, and death due to exposure. Since there are twelve more white-footed mice per acre in burned areas than unburned ones, the importance of a repellent oil, a capsule, a seed pellet, or a poison seed is great. Repellent

oils, as they are known today, are relatively unsuccessful in that they mar their good records by preventing germination. In addition, creosote is the only coating known at present which will serve effectively as a repellent. A good pellet which will stave off rodent attack is needed badly.

As an experiment, seeds were painted green to fool the bird population of various areas. The Tillamook burn has a very small population consisting mainly of quail, grouse, and a few sparrows, and the problem of bird damage to seeds is negligible.

Mortality during the early days of seedling life is due primarily to changes in temperature through exposure or magnified temperatures in the black ash of burned sites.

A problem of significance is fire protection of the Tillamook burn expanses. State protection agencies plus the Northwest Oregon Fire Patrol Association serve to make the snag-infested hills less dangerous, and with the use of lookouts and wardens using radio, there seems to be less chance for another Tillamooker to occur. With its record, however, the burn offers a threat to every seedling whether present or proposed. Leading state officials in the Salem department are of the opinion that 75%

of the difficulty encountered will be directly concerned with protection problems, whereas the actual restocking will be relatively simple.

THE ELEMENT OF TIME

The estimated time required to restock the Tillamook burn is ten years. This ten years, if untilized in constructing fire break corridors and planting by hand or plane, might see the burn replanted sufficiently to insure a timber crop in some eighty years.

It is expected that lumber of saw timber size will be found on Site I land in sixty years, while the Site II might require seventy to eighty years. If such growth occurs, the state might sell 225 million board feet of timber per year thereafter. (5) The annual cash income would reach $1,125,000 per year, of which 25% would reach lean county treasuries.

Of importance is the fact that state planters cannot begin planting operations on areas now being salvaged until the logging operations are finished. These salvaged areas are perfect seedbeds when the operation is concluded, and the state has given contracts for experimental plots to commercial outfits engaged in clearing snags for profit. The activities of such companies are worthy of mention. Stimson, Consolidated, Lincoln-Haines, and associated lumber

companies have succeeded in salvaging six billion board feet of commercially valuable timber from the burn in a period of fourteen years, and a potential two billion more is present in good condition. An assistant state forester predicted in 1939 that a private company could not make a profit from the salvage even with its own mill. At present, nine years later, Stimson and others are still making money by salvaging only 45%-55% of the original timber. These companies have cooperated closely with state officials in protecting and salvaging the area, and it is reasonable to expect them to assist in any way possible when the restocking plan is put into operation.

It must be realized that the problem facing land owners in these counties is a tremendous one. 300,000 acres of unusually-productive timber land in an unusually dormant state cannot help the economy of the industry and it cannot ease the tax problem of the area. Only by returning to the slopes their normal growing cover of merchantible timber can the damage be repaired.

CONCLUSIONS AND RECOMMENDATIONS

1. The plan will be an expensive one.
2. Long range thinking must be applied in the formulation of a final plan of action.
3. It will be extremely difficult to establish seedlings in the area, since a 1:10 survival may be expected.
4. Natural reproduction cannot restock the area in less than two-hundred years.
5. Species planted should be those found on the area before the first burn in 1933.
6. Fire break corridors should be cut before the restocking operation is put into action.
7. Miller tools for seedlings and seed should be applied when hand methods are desired.
8. Ridge planting, or skeleton planting, might prove effective in establishing seed blocks in strategic locations.
9. Planting by plane is recommended as the best means of restocking so large an area provided the safety of seeds and seedlings is assured.
10. It is urged that direct action be taken at once toward restoring one of Oregon's finest forest areas.

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