

Vegetation Following Slash Fires in One Western Oregon Locality

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BROADCAST BURNING of logging slash following clearcutting is a common forest management practice on the west side of the Cascade Range. A study (Morris, 1958) to measure effects of slash burning on fire hazard and on revegetation of conifers and other plants was begun in 1946 in the Douglas-fir subregion of Oregon and Washington. In this paper, some ecological effects of slash fires near Oakridge, Oregon, will be considered, using data from a small portion of the study area.

Before slash burning, pairs of adjacent, rectangular plots, about one-fourth acre each, were selected. One plot of each pair was burned with the rest of the clearcut unit. The other plot was left unburned to provide a control. If less than two-thirds of the ground was blackened on a burned plot, or if an especially hot or fast-spreading fire burned a portion of the proposed unburned plot, the pair was rejected. These rejections tended to leave for study only those plots that had medium intensity slash fires. Thirteen pairs of plots in the Oakridge area survived rejections.

A pair of plots was always selected on the same slope, with the same aspect and similar slash. Pairs range between elevations of 2250 to 3750 feet, slopes of 0 to 40 per cent, and six aspects: N., S., W., NE., SE., and SW. The plots are at an average distance of 350 feet from the nearest conifer seed source; the closest pair is within 50 feet, the farthest 1000 feet from standing timber. One pair receives a little afternoon shade; 12 pairs are in the open. Most pairs are at midslope, but one is in a creek bottom. The timber type prior to logging was old-growth Douglas-fir (*Pseudotsuga menziesii*)¹ with western hemlock (*Tsuga heterophylla*) and true fir (*Abies* spp.) associates. The pair located in a creek bottom had a Douglas-fir—western redcedar (*Thuja plicata*) stand. Site class, or productivity of the plots for tree growth, ranged from site II to site IV.²

¹ Authorities used for common and scientific names are Little (1953) for trees and some shrubs and Kelsey and Dayton (1942) for other vegetation.

² Site class is determined by the relation between total height of dominant or codominant trees and tree age. Site class I is best, site class V is poorest.

One or more plots were burned each year from 1946 to 1951. Cover records beginning in 1947 were collected annually to 1953, except that six of the older plots were skipped in 1952. After a nine-year interval, the final examination was made in 1962.

Vegetation was placed in three categories: conifer, brush, and herbaceous. Pacific yew (*Taxus brevifolia*) and all broadleaf tree species were considered brush.

Conifer Stocking

Conifer stocking was estimated by per cent of 4-milacre subplots having one or more naturally established conifer seedlings 6 or more inches high. Twenty-five subplots were examined in each burned and unburned plot, except at last examination when 12.5 subplots were examined.

During the first few years, unburned plots had significantly greater stocking than burned plots (Figure 1). The records show that only a few of the seedlings on the unburned plots became established before the logging. By the seventh year, however, burned plots caught up with the unburned; both burned and unburned plots then had about 60 per cent of the 4-milacre subplots stocked. The 11- to 16-year examination showed that both burned and unburned plots still had about 60 per cent stocking. By this time, the trees ranged from 6 inches to 25 feet.

In addition to stocked subplot analysis, in which all commercially important

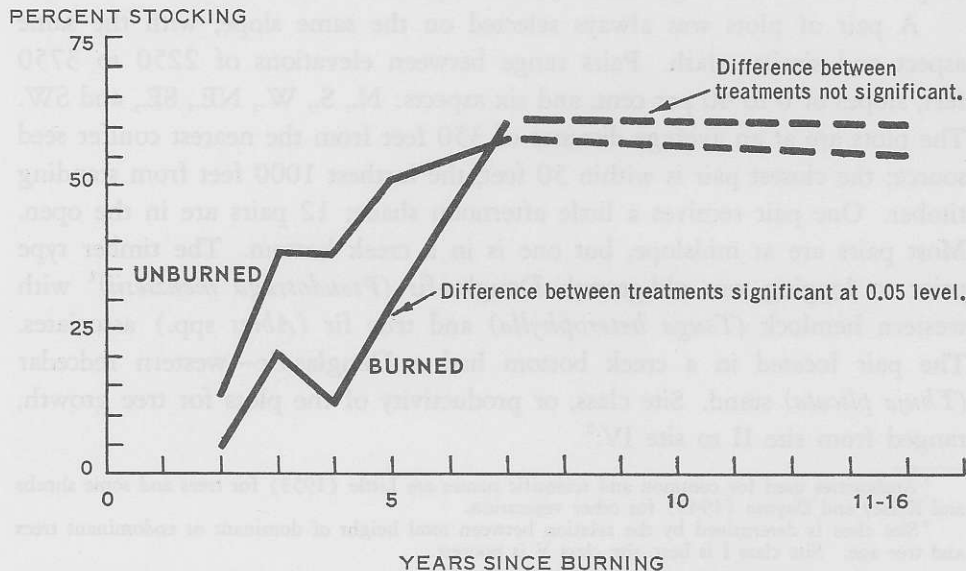


Figure 1. Conifer stocking on 13 pairs of burned and unburned plots.

species were recorded alike, a comparison was made of numbers of seedlings by species for burned and unburned plots. General differences between plots were similar to those noted in the stocking comparison. The most numerous species on both unburned and burned plots was Douglas-fir.

Brush Cover

The proportion of available growing space (rock, wood, etc. were not considered available growing space) shaded by brush was estimated by a vertical projection of the brush canopy. These estimates were made on the same subplots used for conifer-stocking estimation. The 4-milacre subplots were visually divided into quadrants, and an estimate of available growing space shaded by brush species was recorded for each quadrant. Then, the proportion of brush cover by individual species was estimated and recorded for each quadrant. As various layers or stories of canopy developed, the estimating system tended to obscure the amount of cover at higher densities. For example, a closed canopy of a low-brush species and a closed canopy of a taller-brush species would be recorded as 100 per cent total shade—not 100 per cent shade by one and 100 per cent shade by the other.

There was significantly more brush on unburned plots for the first five years; however, by seven years, differences were no longer significant (Figure 2). Total cover ranged from 1 per cent on burned and 6 per cent on unburned plots after two years to about 40 per cent cover on both by 11 to 16 years.

Proportion of cover by individual species was also studied at different periods after burning. Since amount of shade depends on size of plant, frequency of occurrence should give a more sensitive measure than shade cover to show effects of fire on species composition. Frequency of occurrence, however, showed essentially the same relation between species as shown by amount of shade cover.

Apparently, the first brush species to become dominant is most likely to remain dominant for at least 10 years. On 54 per cent of burned samples, the brush species dominant two years after burning was still the major species 11 to 16 years after burning. On 69 per cent of unburned samples, initial dominant species of brush were still dominant at the last examination.

Individual brush species exhibited definite responses to treatment (Table 1). Ceanothus (includes both snowbrush ceanothus (*Ceanothus velutinus*) and varnishleaf ceanothus (*C. velutinus* var. *laevigatus*)) conspicuously dominated burned plots but covered very little of the unburned. Blueberry elder (*Sambucus glauca*) and hairy manzanita (*Arctostaphylos columbiana*) provided more cover on burned plots than on unburned plots, although they occupied

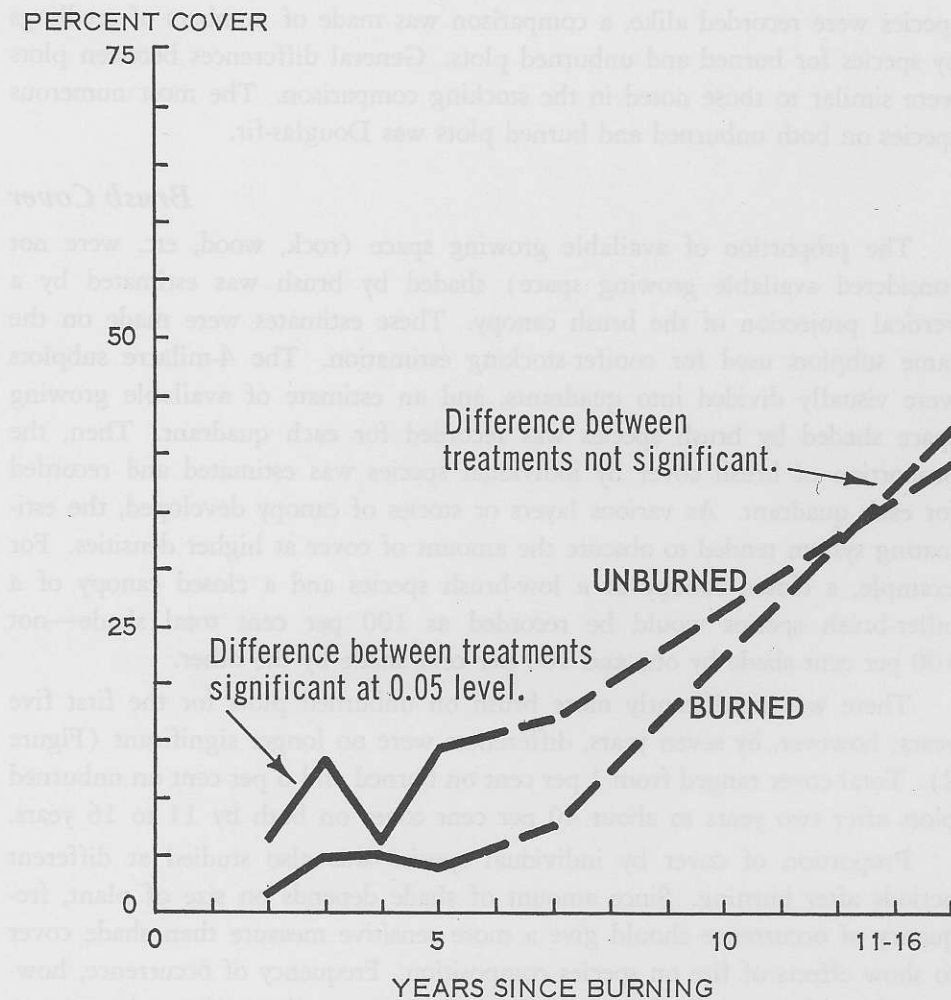


Figure 2. Per cent of ground shaded by brush on 13 pairs of burned and unburned plots.

a small proportion of the area. Pacific yew and blueberry (*Vaccinium* spp.), including red whortleberry (*V. parvifolium*), occurred rarely on burned plots, but both were commonly found on unburned plots. However, red whortleberry is often found on burned areas in the northern Cascade Range and in the Coast Ranges of Oregon. Pacific rhododendron (*Rhododendron macrophyllum*) and salal (*Gaultheria shallon*) were also found mainly on unburned plots. Vine maple (*Acer circinatum*) provided little more shade on unburned than on burned plots. By 11 to 16 years after burning, vine maple litter had formed dense mats on the ground (which could severely limit the occurrence of any other vegetation), but ceanothus litter had not formed dense mats

TABLE 1.

PER CENT OF BRUSH SHADE COVER FOR EACH MOST COMMON BRUSH AND HERBACEOUS SPECIES ON 13 PAIRS OF PLOTS AFTER SLASH BURNING; 1962 EXAMINATION¹

| Species | Burned plots | Unburned plots |
|--|-----------------|-------------------|
| Brush: | | |
| Snowbrush ceanothus (<i>Ceanothus velutinus</i>) and Varnishleaf ceanothus (<i>C. velutinus</i> var. <i>laevigatus</i>) | 55.4 | 3.3 |
| Pacific rhododendron (<i>Rhododendron macrophyllum</i>) | 4.9 | 30.5 |
| Vine maple (<i>Acer circinatum</i>) | 11.7 | 17.9 |
| Salal (<i>Gaultheria shallon</i>) | 2.5 | 11.7 |
| Golden chinkapin (<i>Castanopsis chrysophylla</i>) | 6.3 | 5.4 |
| Cherry (<i>Prunus</i> spp.) | 3.4 | 7.4 |
| Blueberry (<i>Vaccinium</i> spp.) | .4 | 5.8 |
| Cascades mahonia (<i>Mahonia nervosa</i>) | 2.2 | 2.5 |
| Western thimbleberry (<i>Rubus parviflorus</i>) | 2.4 | 1.7 |
| Pacific yew (<i>Taxus brevifolia</i>) | 0 | 4.4 |
| Hairy manzanita (<i>Arctostaphylos columbiana</i>) | 3.2 | .3 |
| Willow (<i>Salix</i> spp.) | .5 | 1.4 |
| Blueberry elder (<i>Sambucus glauca</i>) | .7 | .1 |
| Miscellaneous ² | 6.4 | 7.6 |
| Total | 100.0 | 100.0 |
| Herbaceous: | | |
| Trailing blackberry (<i>Rubus macropetalus</i>) | 30.7 | 22.0 |
| Willowweed (<i>Epilobium</i> spp.) | 28.4 | 27.4 |
| American twinflower (<i>Linnaea borealis</i> var. <i>americana</i>) | 1.5 | 20.8 |
| Modest whipplea (<i>Whipplea modesta</i>) | 10.8 | 7.2 |
| Cerastium (<i>Cerastium</i> spp.) | 5.8 | 7.9 |
| Peavine (<i>Lathyrus</i> spp.) | 5.0 | 2.2 |
| Lupine (<i>Lupinus</i> spp.) | 1.9 | 1.4 |
| Grasslike plants (<i>Gramineae</i> and <i>Cyperaceae</i>) | 2.5 | .6 |
| Western starflower (<i>Trientalis europaea</i> var. <i>latifolia</i>) | 2.1 | .6 |
| Western bracken (<i>Pteridium aquilinum</i> var. <i>pubescens</i>) | .8 | .3 |
| Bunchberry dogwood (<i>Cornus canadensis</i>) | 0 | .8 |
| Miscellaneous ² | 10.5 | 8.8 |
| Total | 100.0 | 100.0 |

¹ Basis: 1300 milacre quadrants on 13 pairs of burned and unburned plots.

² Includes small amounts of the above species and those in Table 2.

(allowing other vegetation to be established). Few species of brush or herbs grew under vine maple, but some did grow under ceanothus. Brush species that were occasionally observed on the plots but were not large enough or dense enough to contribute to shade estimates are listed in Table 2.

TABLE 2.
OCCURRENCE OF LEAST COMMON BRUSH AND HERBACEOUS SPECIES ON 13 PAIRS
OF PLOTS AFTER SLASH BURNING; 1962 EXAMINATION¹

| Species | Burned plots | Unburned plots |
|--|-----------------|-------------------|
| Brush: | | |
| Whitebark raspberry (<i>Rubus leucodermis</i>) | X | X |
| Pacific madrone (<i>Arbutus menziesii</i>) | X | X |
| Rose (<i>Rosa</i> spp.) | X | X |
| Common snowberry (<i>Symphoricarpos albus</i>) | 0 | X |
| Currant (<i>Ribes</i> spp.) | X | X |
| Gooseberry (<i>Ribes</i> spp.) | X | X |
| Red alder (<i>Alnus rubra</i>) | 0 | X |
| Black cottonwood (<i>Populus trichocarpa</i>) | 0 | X |
| Mountain-ash (<i>Sorbus</i> spp.) | 0 | X |
| Cascara buckthorn (<i>Rhamnus purshiana</i>) | 0 | X |
| Creambush rockspirea (<i>Holodiscus discolor</i>) | X | 0 |
| Cutleaf blackberry (<i>Rubus laciniatus</i>) | X | 0 |
| Herbaceous: | | |
| Hawkweed (<i>Hieracium</i> spp.) | X | X |
| Cudweed (<i>Gnaphalium</i> spp.) | X | X |
| Common pearleverlasting (<i>Anaphalis margaritacea</i>) | X | X |
| Thistle (<i>Cirsium</i> spp.) | X | X |
| Solomonplume (<i>Smilacina</i> spp.) | X | X |
| Trefoil foamflower (<i>Tiarella trifoliata</i>) | 0 | X |
| Western swordfern (<i>Polystichum munitum</i>) | X | X |
| Bedstraw (<i>Galium</i> spp.) | X | X |
| Groundsel (<i>Senecio</i> spp.) | X | 0 |
| Ladyfern (<i>Athyrium filixfemina</i>) | X | X |
| Violet (<i>Viola</i> spp.) | X | X |
| Deerfoot vanillaleaf (<i>Achlys triphylla</i>) | 0 | X |
| Inside-out flower (<i>Vancouveria hexandra</i>) ² | 0 | X |
| British Columbia wildginger (<i>Asarum caudatum</i>) | 0 | X |
| Oregon tea (<i>Satureja Douglasii</i>) ² | X | 0 |
| Trillium (<i>Trillium</i> spp.) | X | 0 |
| Oxalis (<i>Oxalis</i> spp.) | X | 0 |

¹ Species observed on plots but not shading enough area to be tallied.

² Common and scientific names from: Gilkey, Helen. Handbook of northwest flowering plants. Ed. 2, 414 pp., illus. Binforde & Mort, Portland, Oreg. 1961.

Herbaceous Cover

Total area shaded by herbaceous species was similar for burned and unburned plots (Figure 3), but there were differences in species composition (Table 1). Eleven to 16 years after logging and burning, trailing blackberry (*Rubus macropetalus*) was the most common species found on both burned and unburned plots, but it shaded more of the burned. Willowweeds (*Epilobium* spp.), including fireweed (*E. angustifolium*), were also common throughout the study area and shaded burned and unburned plots equally. This was expected, as the spreading habit of willowweeds is well known. American twinflower (*Linnaea borealis* var. *americana*), which is common in uncut

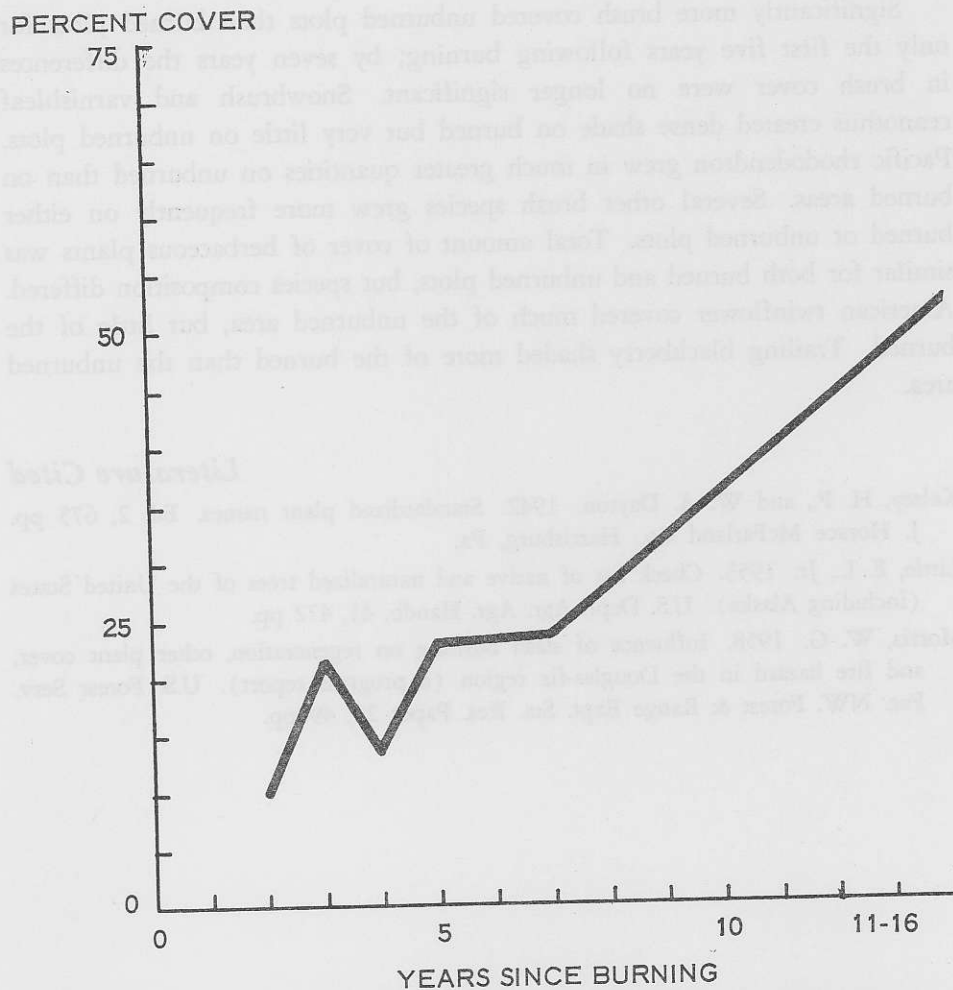


Figure 3. Per cent of ground shaded by herbaceous plants on 13 pairs of burned and unburned plots.

stands, shaded 14 times more area on unburned than on burned plots and was the third most common herbaceous plant (after trailing blackberry and willow-weeds).

Summary

Frequent examinations of 13 pairs of plots near Oakridge, Oregon, during the first 11 to 16 years following slash burning, showed some effects of burning logging slash. Significantly more conifer reproduction was found on unburned plots for the first six years following slash burning. However, by seven years, there was no longer a significant difference between conifer stocking on burned and unburned plots.

Significantly more brush covered unburned plots than burned plots for only the first five years following burning; by seven years the differences in brush cover were no longer significant. Snowbrush and varnishleaf ceanothus created dense shade on burned but very little on unburned plots. Pacific rhododendron grew in much greater quantities on unburned than on burned areas. Several other brush species grew more frequently on either burned or unburned plots. Total amount of cover of herbaceous plants was similar for both burned and unburned plots, but species composition differed. American twinflower covered much of the unburned area, but little of the burned. Trailing blackberry shaded more of the burned than the unburned area.

Literature Cited

- Kelsey, H. P., and W. A. Dayton. 1942. Standardized plant names. Ed. 2, 675 pp. J. Horace McFarland Co., Harrisburg, Pa.
- Little, E. L., Jr. 1953. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agr. Agr. Handb. 41, 472 pp.
- Morris, W. G. 1958. Influence of slash burning on regeneration, other plant cover, and fire hazard in the Douglas-fir region (a progress report). U.S. Forest Serv. Pac. NW. Forest & Range Expt. Sta. Res. Paper 29, 49 pp.