Grass Seedings on Lodgepole Pine Burns in the Northwest[1]

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The direct losses of timber, range, wildlife, and watershed values resulting from forest fires are generally well recognized. Less obvious, but frequently of equal magnitude, are those losses associated with the time required to re-establish a desirable vegetative cover. Natural re-vegetation may be too slow to prevent accelerated erosion and many of those plants which do become quickly established are shallow rooted and weedy in nature. Where multiple-use has been accepted as a basic principle of good land management, the object should be to return the land to productivity as rapidly as possible, with each use given consideration commensurable to its value.

One approach to this problem, seeding to perennial grasses, was examined by the Soil Conservation Service in lodgepole pine (*Pinus contorta*) stands in eastern Washington. The study was made on the Okanogan National Forest where lodgepole pine is clear-cut in blocks and slash is removed by controlled burning. This practice may also be applied to similar burned-over situations created by accidental fires.

Seedings were made with the following objectives:

1. To provide protective cover for denuded soil
2. To provide grazing for livestock.
3. To prevent overstocking by lodgepole reproduction.
4. To reduce invasion by brush.

Considerable published material is available pertaining to seeding burned-over sites and a portion of this is directly applicable to burns in lodgepole pine. Soil and watershed protection and forage production are two important reasons for reseeding certain burned-over forest areas (Friedrich, 1947). Christ (1934), working in northern Idaho, found it essential to seed burns the fall of the fire or early the following spring for successful establishment.

A study on reseeding lodgepole pine burns in eastern Oregon revealed that heavy stands of perennial grass decreased the numbers of lodgepole seedlings (Pickford and Jackman, 1944). This was considered desirable because the heavy lodgepole thickets, which often follow a burn, are of little value for wildlife or grazing, and are undesirable for best tree growth.

A restrictive effect of seeded grasses on natural forest regeneration has also been noted on ponderosa pine (*Pinus ponderosa*) stands of the Southwest (Pearson, 1942), but a careful check of 52 areas in the eastside forests of Washington and Oregon revealed no evidence that seedings decreased subsequent regeneration to ponderosa pine (Gjertson, 1949). Perhaps the ability of this drought resistant conifer to strike a deep taproot enables it to compete more effectively with perennial grasses. A more complete review of literature pertaining to seeding

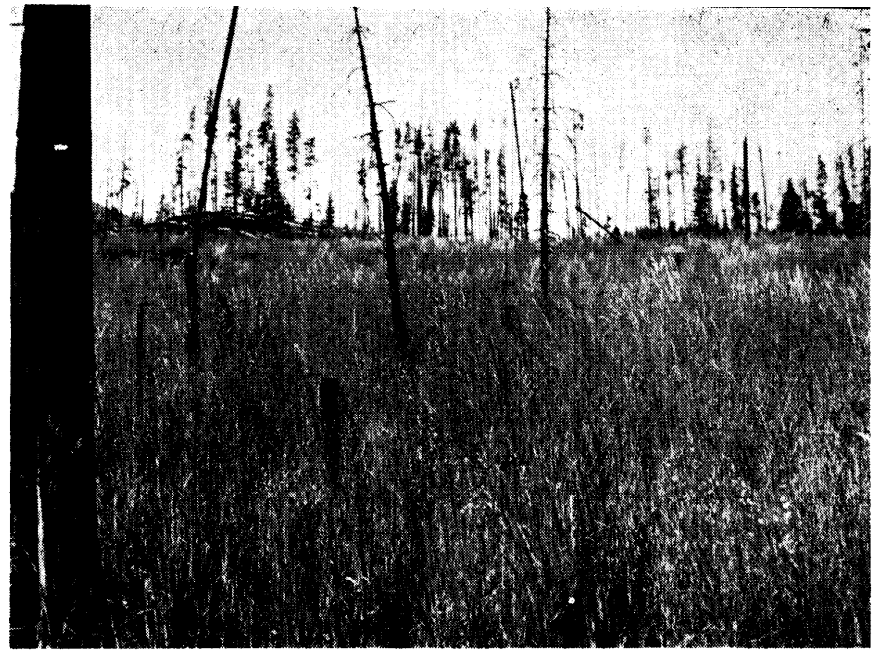

FIGURE 1. Site of exclosure on seeding made at Okanogan in October, 1953. This photo, taken in August, 1955, illustrates the excellent growth made by seeded grasses during the year following establishment.

[1]*Contribution from the Soil Conservation Service, Plant Materials Center, Pullman, Washington. Part of the material in this paper was used in the author's Master of Science thesis, which was prepared under the direction of Dr. E. W. Tisdale, Head, Department of Range Management, University of Idaho.*

burned-over forest lands has been presented by McClure (1956).

Description of Area

Site conditions were uniform throughout the study area. Soils are a deep sandy loam, and all seedings were made on slopes of 10 to 20 percent with southeast exposure. The elevation of the lodgepole stands was about 4,500 feet, and rainfall averaged about 23 inches per year. The forest cover on these sites prior to logging was dominated by thick but vigorous stands of lodgepole pine with a few scattered western larch *(Larix occidentalis)* and Douglas fir *(Pseudotsuga Menziessii)*.

Methods and Procedure

This study was conducted by the author as an employee of the Soil Conservation Service in 1955 and 1956 on seedings made by the U. S. Forest Service during the previous 3 years. The Forest Service had sold lodgepole stumpage for clear-cutting in blocks. Following logging operations the slash was broadcast burned (where it had fallen) under controlled conditions to reduce the fire hazard. Burns were made in the fall following logging, during each of three consecutive years—1952, 1953, and 1954.

A mixture of grasses was broadcast with cyclone seeders as soon as the ashes cooled after each burn. The seed mixtures were not entirely uniform, but the bulk of seed in all three instances was made up of orchard grass, timothy, Manchar smooth bromegrass *(Bromus inermis)*, and tall oatgrass. A total of 6 pounds of seed per acre was applied to the burns. Labor and seed costs averaged $4.50 per acre for the three plantings.

The seeded areas remained ungrazed through 1953 and 1954 and were available for study in the spring of 1955, when an exclosure (2 rods by 4 rods) was established on a representative part of each seeding. Cattle were turned into the area in late June. Through salting and a minimum of herding they were discouraged from utilizing the 1954 seeding. The 1952 planting was grazed much heavier than the 1953 one because it was more accessible, and forage was abundant on both seedings throughout the grazing season. Studies of basal density, forage production, and utilization were made on the burn sites in early August of 1955. The basal density of each stand was measured by 800 point quadrat readings according to the method of Levy and Madden (1933), and the volume of forage inside and outside each exclosure was determined by clipping plots and oven-drying the plant material. Ten 2¼ square foot plots were clipped for each yield determination.

In 1956, only the 1954 seeding was grazed extensively. Utilization of seeded grasses was prescribed by the grazing management plan of the national forest and regulated through the excellent cooperation of permittees.

FIGURE 2. Cattle grazing the 1952 seeding at Okanogan. This stand of grass produced 2,300 pounds of forage (oven-dry) per acre and was 70 percent utilized when the photo was taken, August 1955.

Results

The grasses used in these tests became established readily. All species included in the mixture made significant contributions to stand density and forage production.

Barren strips on the 1952 seeding, where a small part of the slash was windrowed before burning, indicated that the fire had become too hot on these areas and grasses did not become well established. The fire on the 1954 burn was not hot enough to burn all duff and many pinegrass *(Calamagrostis rubescens)* and heartleaf arnica *(Arnica cordifolia)* plants survived to compete with the grass seedlings. Burning was most uniform and of desirable intensity on the 1953 seeding area.

A summary of the quantitative data collected is presented in Table 1. These grass stands provided sufficient basal density and litter during the second growing season to give good protection against erosion. Except for the 1954 burn, in which many native plants survived, seeded grasses made up nearly all the herbaceous cover on the burned-over area. In addition to improving watershed values, this rapid development of cover was

Table 1. Basal density, oven-dry yield, and percent utilization of seedings on lodgepole burns, Okanogan National Forest. (Data collected August 1955 and August 1956).

Time of Seeding	% basal density 1955	Yield-lbs/acre		Percent use	
		1955	1956	1955	1956
October 1952	7.5	2310	1280	75	10
October 1953	6.5	2130	2150	5	15
October 1954	0.7	20*	....†	0	80

* Establishment year.
† Weedy, not clipped.

effective in preventing the establishment of weeds.

The trend of forage production on these seedings to date has been in accordance with a pattern noted in other studies of this nature in the Northwest. In most cases, grass seedings on burned-over forest land require one year for establishment and then produce heavily during the two following growing seasons. This initial heavy production has been partially attributed to the available nitrogen released to the soil at the time of the burn (Vlamis, Biswell and Schultz, 1955). Production may be expected to drop 30 to 40 percent after two seasons and to remain relatively stable at this new level for several years.

In 1955 and again in 1956 more than one ton of dry forage per acre was produced on the 1953 seeding. In 1956 there was a significant drop in production on the 1952 seeding. However, heavy residue present in the spring of 1955, the first year of study, indicated that this seeding also produced heavily for two growing seasons.

The 1954 seeding was grazed heavily in 1956. Production was not measured because this stand contained a large percentage of native plants which survived the fire. Pinegrass and heartleaf arnica predominated. Utilization of seeded species was estimated at 80 percent. This was heavier than normally recommended but cattle were concentrated in this area to protect a new seeding made in October 1955.

An estimate of the monetary value of forage produced on the Okanogan burns may be obtained by applying empirically derived cost and return figures to the results of the study. Figures established in this manner are as follows:

1. Oven-dry forage required to keep a yearling steer for one month - 700 pounds.
2. Average daily gain of yearling steers on good quality summer range - 1.5 pounds.
3. Average value per 100 weight of grass fat steers in the fall of 1955 - $17.00.

Calculation with the estimated values shows that the volume of forage utilized on the 1952 seeding during the first year of the study would produce 112 pounds of beef per acre, valued at $19.04. Considering that the total cost of seeding was $4.50 per acre and that several seasons of grazing may be realized, the calculated monetary gains indicate that rapid and complete returns from investment may be obtained when multiple use is considered desirable and the forage can be readily harvested. Even when this is not so, the long-term values of erosion control, watershed yield, and noxious weed control may justify the low initial cost of this practice.

Other studies made over the past 15 years by the Soil Conservation Service have shown that successful establishment of a *legume-grass* mixture on burned-over areas provides additional advantages. Quality of forage is superior to grass alone, and production may be maintained at a higher level for many years. However, erratic results in legume establishment do not warrant specific recommendations for mixed seedings at this time.

No tree reproduction could be found on the two younger seedings, but larch and lodgepole seedlings were noted throughout the 1952 grass planting. A good stand of lodgepole reproduction was noted in a nearby area which was burned and seeded in 1950. Observations to date indicate

FIGURE 3. This picture is of a seeding made in 1950. This seeding was not evaluated for forage production but was photographed to show the excellent stand of lodgepole reproduction which has become established in the timothy and redtop (*Agrostis alba*) sod; August 4, 1955.

that seed source and climatic conditions are the primary factors influencing forest regeneration. The competitive effect of perennial grass cover is subordinate to and modified by the impact of these two major influences.

Summary

Three field-scale plantings of perennial grasses were made in consecutive years following clear-cut logging and controlled burning of lodgepole pine. Orchard grass, Manchar brome, timothy, and tall oatgrass became readily established and by the second year provided excellent ground cover and a considerable volume of feed for livestock.

Erosion and weed control, and forage and watershed values obtained have been convincing evidence of the economic feasibility and conservation value of seeding perennial grasses following fire in lodgepole pine.

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