

FOREST GRAZING: WILLAMETTE VALLEY PLOTS REVISITED 20 YEARS LATER

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Although agroforestry in Oregon has received increasing public attention in recent years, the concept of optimizing land productivity by combining livestock grazing with timber production on Oregon's timberlands is far from new. In 1952, Dr. D. W. Hedrick (then professor of range management) and Dr. R. F. Keniston (professor of forest management) at Oregon State University, together with a graduate student (F. C. Hall), began a small-scale agroforestry study in the foothills of the Coast Range near Corvallis. The goal of their project was to evaluate ways to increase the productivity of Oregon white oak (Quercus garryana) woodlands. The three specific alternatives which they selected for study were: (1) maximize forage production for livestock by clearcutting all oak trees, then seeding the area to improved pasture plants; (2) increasing timber production by converting from oak forest to a commercial Douglas-fir (Pseudotsuga menziesii) plantation; and (3) converting from oak forest to a Douglas-fir plantation, then managing for concurrent livestock and timber production. For this paper, we will focus on the latter two alternatives. Two specific questions studied were: (1) Is removal of oak trees required for successful establishment and subsequent growth of Douglas-fir trees? and (2) Is grazing compatible with establishment and growth of Douglas-fir plantations in the white oak woodland? This portion of the study involved Douglas-fir production under several levels of site preparation, with or without interim grazing in the establishment years. Initial collection of tree growth and site data was discontinued in 1964. Trees on the study area have been left undisturbed since that time. The site was revisited in 1985 to evaluate the influence of grazing and site preparation on tree development during the past 20 years.

METHODS

The study area is three miles northwest of Corvallis, Oregon, on a north-facing slope. Oregon white oak was the principal tree species present in 1952, although Douglas-fir was believed to have been formerly more abundant (Sprague and Hansen 1946). Three levels of site preparation were applied to two-acre plots in 1952: (1) no treatment, (2) oak thinned, and (3) oak clearcut. In the oak thinned treatment, approximately 50% of the oak stems were removed, resulting in approximately 70% reduction of the original crown cover. On the clearcut plot all oaks were removed. All three sites were planted with 2-0 Douglas-fir seedlings at the rate of 1,000 trees per acre during 1952-53.

From 1954 to 1960, inclusive, yearling ewes were grazed for three or four weeks each spring on one-half of each of the three thinning treatments. Sheep were weighed during grazing and were removed when they failed to maintain weight gains. By the time the sheep were removed each year, approximately 50% of the available palatable forage had been consumed. Grazing was discontinued after 1960 because of the scarcity of good forage and the difficulty of handling sheep in the dense oak coppice.

In the original study, eight random sites were permanently marked on each treatment combination. Each planted tree found in a 3-mil acre area centered on each site was staked and lettered in a clockwise direction starting from true south of the plot center. Survival and height of Douglas-fir trees were recorded each year until 1964. In 1985, the original markers were relocated. Using the original data sheets, individual trees in the 3-mil acre sites were identified and their height recorded.

RESULTS AND DISCUSSION

Of the original sample sites established in 1953, several could not be relocated. Therefore, 1985 estimates are based on seven of the eight original sample sites in each of the treatment combinations.

Treatment effects on Douglas-fir survival and growth during the past 20 years are generally consistent with those which were already evident in 1964 (Hedrick and Keniston, 1966). Although both site preparation and grazing had a small effect on conifer survival during the initial four years after planting, no treatment effects were evident in 1964. Average survival of planted conifers during the 1952-1985 period was 56% and did not vary among either site preparation or grazing treatments.

Effects of site preparation or grazing on Douglas-fir height are summarized in Table 1. As one might expect, site preparation had its largest effect upon Douglas-fir growth during the early years of the plantation. The effect of thinning reached its maximum in 1960, eight years after planting, when trees on clearcut plots were almost twice as tall as trees on the unthinned control plots. After 33 years of growth, in 1985, difference in height between clearcut and unthinned plots had declined to 21%. However, the absolute value of the difference (about 90 inches) was considerable. It is interesting to note that although trees on clearcut plots were taller than those on thinned plots during the first eight years after planting, by 1985, there was no difference between them.

Heights of trees from sheep-grazed plots were approximately 48 inches greater than those of ungrazed plots in 1985. Of this difference, approximately half (22 of the 48 inches) accumulated during the 1958-1964 period. The effects of grazing have apparently continued long after grazing ceased in 1960. Tree height growth from 1960 to 1985 was 454 inches per tree on grazed plots compared to only 419 inches per tree on ungrazed plots.

OVERVIEW

The results previously reported for this study (Hall et al., 1959; Hedrick and Keniston, 1966), together with our data, suggest two simple conclusions:

- (1) Thinning of oak trees is not necessary to successfully establish a stand of Douglas-fir on better sites within the oak woodland. Growth of Douglas-fir regeneration, however, was substantially greater where oaks were thinned or clearcut. Conifer growth response to thinning of the oak

overstory will probably be greatest during the first 10 years of a plantation, when site preparation effects are "fresh." It is not necessary to clearcut oaks to establish a Douglas-fir plantation. Both conifer survival and growth were similar regardless of whether oaks were thinned or were totally removed by clearcutting.

(2) Grazing during the early years of plantation life was beneficial in that growth of young conifers was substantially greater on grazed than on ungrazed plots, while tree survival was unaffected by grazing. Increased vigor of conifers on grazed plots carried over to years well beyond 1960 when grazing ceased. Increased tree height resulting from grazing was still evident in 1985, 25 years since sheep left the plantations. These results, together with those of several other researchers working in Oregon (see Recommended Readings) strongly suggest that PROPERLY APPLIED livestock grazing may be a useful silvicultural tool, as well as an economic component of timberland management systems in Oregon. Additional information concerning forest-grazing in Oregon may be found in articles from past year's Range Field Day Reports:

Carlson, D. H., S. H. Sharrow, and D. P. Lavender. 1984.

Agroforestry: Optimizing livestock and forest productivity. p. 25-29. IN: 1984 Research in Rangeland Management. Oregon Agricultural Experiment Station Special Report 715.

Doescher, P. S., and M. Alejandro. 1985. Cattle and establishment of conifer seedlings: Preliminary findings for southwest Oregon. p. 7-10. IN: 1985 Research in Rangeland Management. Oregon Agricultural Experiment Station Special Report 743.

Leininger, W. C., and S. H. Sharrow. 1983. Sheep and timber: are they compatible? p. 23-27. IN: 1983 Research in Rangeland Management. Oregon Agricultural Experiment Station Special Report 682.

Wheeler, W. P., W. C. Krueger, and M. Vavra. 1980. The effect of grazing on survival and growth of trees planted in a northeast Oregon clearcut. p. 28-31. IN: 1980 Research in Rangeland Management. Oregon Agricultural Experiment Station Special Report 586.

LITERATURE CITED

Hall, F. C., D. W. Hedrick, and R. F. Keniston. 1959. Grazing and Douglas-fir establishment in the Oregon white oak type. Journal of Forestry 57:98-103.

Hedrick, D. W., and R. F. Keniston. 1966. Grazing and Douglas-fir growth in the Oregon white-oak type. Journal of Forestry 64:735-738.

Sprague, F. L., and H. P. Hanson. 1946. Forest succession in the McDonald Forest, Willamette Valley, Oregon. N. W. Science 20:89-97.

Table 1. Mean height (inches) of Douglas-fir trees from thinning and grazing treatments. Data for 1954-1964 were taken from Hedrick and Keniston (1966)¹

Year	Site Preparation			Grazing	
	None	Thinned	Clearcut	Grazed	None
1954	7.5 ^a	9.0 ^a	13.5 ^b	9 ^a	11 ^a
1956	13.5 ^a	18.5 ^b	25.0 ^c	18 ^a	19 ^a
1958	24.0 ^a	35.0 ^b	47.5 ^c	37 ^a	34 ^a
1960	38.5 ^a	57.5 ^b	72.0 ^c	62 ^a	49 ^b
1962	53.5 ^a	86.0 ^b	99.5 ^b	90 ^a	68 ^a
1964	72.0 ^a	116.0 ^b	126.5 ^b	117 ^a	92 ^b
1985	426.0 ^a	534.0 ^b	516.0 ^b	516 ^a	468 ^b

¹ Means for each treatment group in a row (i.e., site preparation and grazing) not sharing a common letter differ (P<.10).