THE EFFECT OF GRAZING ON SURVIVAL AND GROWTH OF TREES PLANTED IN A NORTHEAST OREGON CLEARCUT

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Large areas of forest land are grazed or have potential for grazing throughout eastern Oregon, the Inland Empire, and much of the montane western United States. Rarely has there been an attempt to fully integrate production of timber and red meat on these lands. Depending on background and philosophy of owners or managers, too frequently there has been a tendency to either advocate exclusion from or allow uncontrolled entry of grazing animals to these lands. Demands for both food and fiber are increasing and will continue to increase in the future. To meet this demand, coordination of resource production and use is essential.

The objective of this study was to determine the feasibility of interim grazing of forested land from immediate post-logging to tree canopy closure and the effect of such grazing on survival and growth of forest regeneration from planted coniferous tree stock.

EXPERIMENTAL PROCEDURE

A 30-acre tract of mixed coniferous forest (predominately grand fir - mountain lover habitat) on the Hall Ranch of the Eastern Oregon Agricultural Research Center was clearcut in the summer of 1963 and broadcast burned in the summer of 1964. Residual cull logs were oriented perpendicular to the prevailing slope. Within this tract, three 5-acre pastures were fenced to exclude cattle. In addition, one of the three pastures was fenced to exclude big game.

In the fall of 1964, all three pastures were seeded to grass utilizing a split-plot design (seeded vs. unseeded) on a random basis. Each plot was 0.5 acre and oriented perpendicular to the slope. Forage species were seeded on the lower half of each treatment at a rate of six pounds per acre with a mixture including orchardgrass, tall oatgrass, timothy, smooth brome, and white clover. The upper half of each plot designated for seeding was further divided longitudinally into two equal subplots, one seeded to blue wildrye and the other to mountain brome at the rate of eight pounds per acre.

In the spring of 1965, coniferous seedlings (2-0 and 3-0 stock) from the U.S. Forest Service Nursery in Coeur d'Alene, Idaho, were planted in each pasture on a random block basis at the rate of 1,000 trees per acre. (Figure 1). Species planted were: ponderosa pine, Douglas-fir, western larch, and western white pine. Spacing was six feet within rows with rows oriented across the slope and seven feet apart.

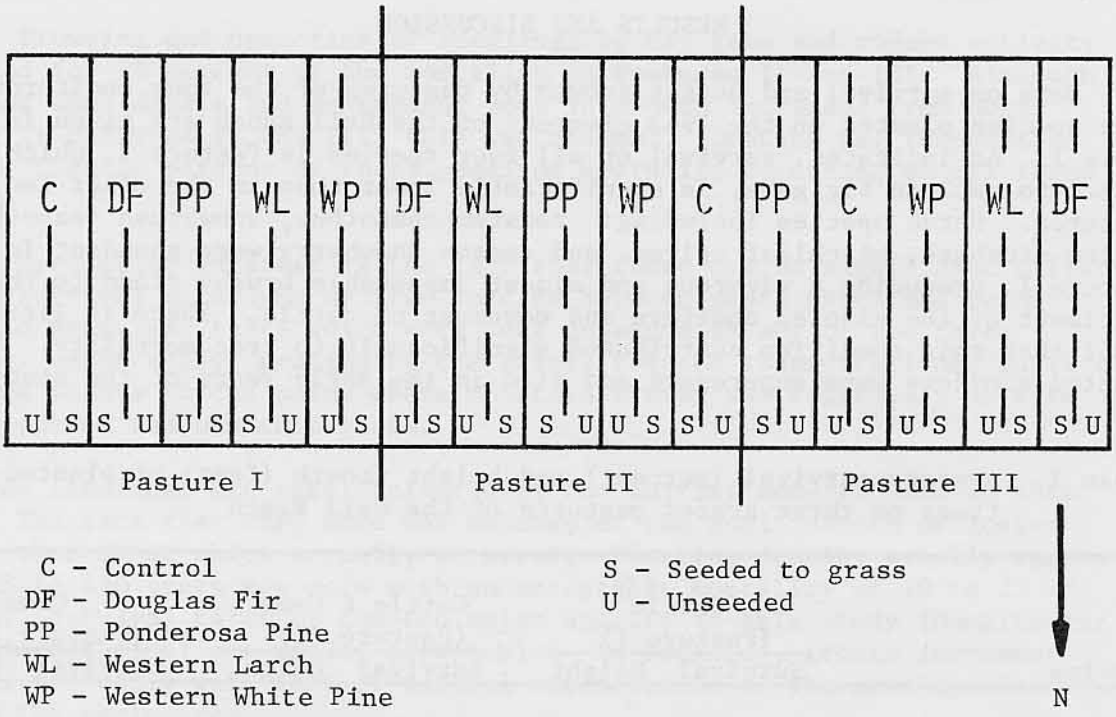

Figure 1. Field design of tree plantations on the Hall Ranch of the Eastern Oregon Agricultural Research Center.

Cattle grazing was initiated in July 1966 with the introduction of five yearling heifers annually in each pasture until 1972 when cattle grazing in Pasture III was discontinued. Grazing was continued in Pastures I and II on an annual basis until 1977. Therefore, grazing treatments were, Pasture I grazed by cattle, Pasture II grazed by cattle and game, and Pasture III grazed only by game. Cattle dispersion was affected by development of the water source at the ridge top and placement of salt blocks at the base of the slope. Cattle entry into cattle into the pastures was timed with the phenology of forage and tree species - - varying from June 15 to July 15 each year. Cattle remained on pasture for approximately one month.

Records of survival and height growth of planted coniferous seedlings were tallied twice annually - prior to and at the conclusion of grazing - - from 1966 through 1977. In addition, evidence of seedling damage and probable causes of mortality were recorded from the time of planting (1965) to 1978.

RESULTS AND DISCUSSION

Data on survival and height growth by pastures of the four coniferous tree species planted on the 1963 clearcut of the Hall Ranch are given in Table 1. As indicated, survival of all four species in Pasture I, which was fenced to exclude big game, is significantly lower than in the other two pastures. Shrub species including: redstem ceanothus, snowbrush ceanothus, mallow ninebark, birchleaf spirea, and common snowberry were abundant in Pasture I, producing a vigorous and almost impassable brushy stand to the detriment of the planted conifers and movement of cattle. There is little doubt that this condition contributed significantly to tree mortality. Many planted conifers were suppressed and died in the early years of the study.

Table 1. Average survival (percent) and height growth (feet) of planted trees on three grazed pastures of the Hall Ranch

Species	Cattle (Pasture I)		Cattle & Game (Pasture II)		Game (Pasture III)	
	Survival	Height	Survival	Height	Survival	Height
Douglas-fir	34	8.84	47*	10.14**	44	9.00
Ponderosa pine	36	7.67	41	9.49**	55**	8.74
Western larch	12	14.69	19	14.37	20**	11.31
Western white pine	12	7.44**	32**	6.76	26	5.20

*significant at the 1.0% level **significant at the 0.5% level

Of the four tree species planted, Douglas-fir and ponderosa pine responded most favorably in all three pastures. Western white pine is not indigenous to the study area and is not found occurring naturally in the surrounding area. Western larch, although part of the overstory plant community adjacent to the study area, did not respond well. Failure of this species most likely was because of poor seedling stock and/or the fact that western larch nursery stock traditionally is spindly and of low caliber compared to the other planted tree species. It is thus quite susceptible to loss from trampling and competing vegetation, particularly brush species.

Rodent activity was most pronounced in Pasture I where improved habitat for gophers and porcupine prevailed. Mortality and/or poor growth rate of ponderosa pine can be attriuted in part to depredations by porcupines in Pasture I.

Mortality of planted conifers traditionally is most pronounced during the first three to four years after planting. Data from the Hall Ranch study show little exception to this pattern. Most losses were caused by drought and rodent activity. Trampling of trees by livestock, where it could be positively identified as such, accounted for eight percent of total seedling mortality and was of no significance after the fourth year of the

study. Browsing and uprooting of seedlings by big game and rodent activity accounted for 18 percent of the mortality in Pastures II and III. Although there was some damage and subsequent loss in growth increment from horn rubbing in Pastures II and III, this was minimal. Drought was responsible for more than 50 percent of total seedling mortality occurring on all three pastures.

Of particular interest is the fact that there was no significant difference in survival or height by tree species between plots which had been seeded to grass and those which were left unseeded in any of the three pastures. Apparently, grazing by the cattle reduced transpirational surface of forage plants to the point where moisture stress was relatively uniform between seeded and unseeded plots.

Tree seedlings are rarely planted at the initial density used in this study. The fact that they were was because of the anticipation of losses greater than those which actually occurred. Planting density usually ranges from 325 to 450 trees per acre with an acceptable mortality of 20 to 25 percent. Survival rates of the two major species in this study (Douglas-fir and ponderosa pine) are wholly acceptable. In addition, growth increment compares favorably with that of natural regeneration of the same species outside the exclosures.

Results of this study and our experiences indicate that survival and growth of planted indigenous timber species and grazing can be compatible if the following conditions are met.

1) Entry and removal of cattle must be accomplished at the proper time (i.e. proper attention paid to the phenological stage of both forage and tree species and no more than 80 percent of the forage species utilized).

2) Provision must be made for dispersal of grazing animals through fencing or riding, and location of water and salt.

3) Preferred forage species should be available in reasonable abundance. If not present, the plantation site should be burned and seeded to adapted bunchgrasses the fall preceding spring planting of tree seedling stock. Tree planting should not be delayed beyond this time.

4) Competition from brush species must be reduced through the use of selective herbicides or big game animals should not be excluded from the plantation.