

# RESPONSES OF HERBACEOUS VEGETATION, PLANTED TREES AND CATTLE ON A FOREST PLANTATION

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This is a synthesis of information collected on a mixed coniferous forest on the Hall Ranch that was clearcut in 1963 and has been managed for production of cattle and a timber crop, with ancillary wildlife uses, since the initial harvest. The study was implemented to quantify changes in vegetation with successional growth of the plantation and responses of trees and cattle over time. In the last 20 years the plantation has progressed to a point where competition between forages and timber is reducing yield, and the plantation is now being thinned to maintain the forage crop and enhance growth of individual trees.

## EXPERIMENTAL METHODS

Through the course of study the area was classified as a mosaic of vegetation types, with the upslope representing a Douglas-fir/ninebark (Pseudotsuga menziesii/Physocarpus malvaceus) habitat type and the toe slope representing a grand fir/mountain lover (Abies grandis/Pachistima myrsinites) habitat type. The area was clearcut in 1963, broadcast burned in 1964, and seeded to a forage mixture with appropriate controls in the fall of 1964. Trees were planted in spring of 1965 and grazing at 1.3 acres per animal unit month was begun in summer, 1966.

Through the course of the study, understory vegetation was measured for frequency utilization and yield, trees were measured for survival and height growth, and cattle were studied to define botanical and nutritive quality of the diet and animal production (for details of study procedures see Krueger, 1983, and Vavra, et al. 1980).

## RESULTS AND DISCUSSION

Plant succession continued to progress through the first 20 years of measurement. The early stages were dominated by bull thistle (Cirsium vulgare). By the end of the period, Kentucky bluegrass (Poa pratensis), elk sedge (Arrhenatherum elatius), orchardgrass (Dactylis glomerata), and blue wildrye (Elymus glaucus) dominated the seeded areas (Table 1). Grazing treatments also directed succession so that the area ungrazed by big game had a greater amount of shrubs which competed with the forage plants used by cattle. Herbaceous plants also showed differential responses when grazed or not grazed by cattle.

Grazing by cattle and big game together depressed annual yield of vegetation after the bull thistle stage from the late 1960's to mid 1970's (Table 2).

Table 1. Average frequency of understory vegetation for the most abundant species on the clearcut, 1965-1982.

Species	Average Percent Frequency							
	Overall 1965- 1967	Overall 1971- 1975	Dual 1971	Cattle 1977	Big Game 1977	Dual 1977	Cattle 1982	Big Game 1982
<b>GRAMINOIDS</b>								
Tall oatgrass	1	6	6	53	56	58	25	23
Smooth brome	t/2	-	-	11	14	4	9	7
Mountain brome	15	12	14	9	14	18	6	30
Elk sedge	3	18	20	26	66	47	51	64
Pinegrass	3	t	5	6	14	17	10	10
Orchardgrass	10	12	7	28	22	24	32	31
Blue wildrye	17	35	26	33	31	44	16	21
Western fescue	1	-	-	16	23	32	6	7
Timothy	19	7	-	30	11	20	7	10
Kentucky bluegrass	1	2	-	38	61	35	20	55
Tall trisetum	-	-	-	3	8	5	26	53
<b>FORBS</b>								
Western yarrow	t	43	50	41	50	55	46	69
Rose pussytoes	-	-	-	2	6	5	11	19
Heartleaf arnica	5	16	8	26	15	31	55	86
Canada milkvetch	10	15	8	29	38	26	33	42
Bull thistle	26	42	59	4	6	2	8	5
Strawberry	10	40	39	44	86	84	84	95
Northern bedstraw	2	5	-	3	2	3	7	6
Western meadowrue	1	-	-	2	1	4	5	8
<b>SHRUBS</b>								
Redstem ceanothus	3/	8	5	27	6	3	15	t
Snowbrush	2	1	-	37	12	11	8	9
Baldhip rose	1	-	-	3	4	3	6	5
Birchleaf spirea	9	2	11	18	11	7	15	13
Snowberry	2	3	-	20	9	12	11	17
Ninebark	10	19	38	35	13	11	27	5

1/ From Pettit, 1968; 2/ t = <1%; 3/ included with snowbrush in 1965; 4/ cattle = cattle grazing only, Big game = big game grazing only, Dual = grazing by cattle and big game; 5/ From Erickson, 1974.

Table 2. Herbaceous production for the clearcut, 1965-1982, in pounds oven dry herbage per acre.

Grazing Treatment	1965 <sup>1/</sup>	1967 <sup>1/</sup>	1974	1982
Cattle only	1100 <sup>a2/</sup>	1400 <sup>a</sup>	1600 <sup>a</sup>	400 <sup>a</sup>
Game only	—	—	1500 <sup>a</sup>	850 <sup>b</sup>
Dual	1700 <sup>b</sup>	900 <sup>b</sup>	950 <sup>b</sup>	750 <sup>b</sup>

1/ From Pettit, 1968  
2/ Values within years followed by different letters are significant.

By the 1980's the encroachment of brush in the pasture not grazed by big game further reduced yields.

Utilization of vegetation was heaviest on orchardgrass at about 55 percent per season. Other important grasses and sedges were utilized to a level of about 40 to 50 percent. The diet of cattle was predominantly grass as measured from fistulated steers grazed in the pasture (Table 3). In one dry year shrubs increased substantially in the diet of cattle in the pasture where they were abundant. No planted conifers were grazed by cattle. Daily gains of yearlings ranged from 1.25 to 2 pounds per day.

Table 3. Class of forage in diets of fistulated steers.

Year	Grass	Forb	Browse
Normal (1972)			
Cattle only	67	10	23
Cattle and big game	65	11	24
Dry (1973)			
Cattle only	45	10	45
Cattle and big game	68	10	22

Survival of planted conifers was similar for each species under each grazing treatment (Table 4). Lower survival of western larch (*Larix occidentalis*) and western white pine (*Pinus monticola*) was attributed to planting stands and site effects. There were no significant differences in survival of planting trees for areas seeded to forages compared to unseeded areas.

Table 4. Survival of planted trees in 1977, thirteen years after planting.

Species	% Survival		
	Game Grazing	Cattle Grazing	Dual Grazing
Douglas fir	62	56	58
Ponderosa pine	62	55	58
Western larch	32	22	28
Western white pine	28	30	36

Height growth of Douglas fir and ponderosa pine (*Pinus ponderosa*) was significantly higher in the pasture grazed by cattle and big game (Table 5). Western larch and western white pine were tallest under grazing by cattle or cattle and big game. There were no significant differences in height growth of planted trees for areas seeded to forages compared to unseeded areas.

Table 5. Height growth (in feet) of planted conifers in 1977, thirteen years after planting.

Species	Game Grazing	Cattle Grazing	Dual Grazing
Douglas fir	9.0 <sup>abl/</sup>	8.8 <sup>b</sup>	10.1 <sup>a</sup>
Ponderosa pine	8.7 <sup>a</sup>	7.7 <sup>b</sup>	9.5 <sup>c</sup>
Western larch	11.3 <sup>a</sup>	14.7 <sup>b</sup>	14.4 <sup>b</sup>
Western white pine	5.2 <sup>a</sup>	7.4 <sup>b</sup>	6.8 <sup>b</sup>

1/ Values within species followed by different letters are significant.

This study illustrated a management technique that is compatible for forestry, livestock, and big game production objectives. The possibility for intensive management of these plantations is good and should help diversify income of these lands over a long time frame.

LITERATURE CITED

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