PLANT SUCCESSION AS INFLUENCED BY HABITAT TYPE, GRAZING MANAGEMENT, AND RESEEDING ON A NORTHEAST OREGON CLEARCUT

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This study is a part of a larger research effort outlined in the previous report by Wheeler, Krueger, and Vavra. To evaluate specific vegetation responses to management activities, a detailed study of vegetation in the clearcut is being conducted. This report describes the plant community development with respect to habitat type (site), grazing and reseeding 14 years after initial harvest.

EXPERIMENTAL PROCEDURE

Each of the 5-acre pastures was sampled according to specific treatments applied or to existing habitat type differences. The upper slope within each pasture is a Douglas-fir/ninebark habitat type and the lower slope is a grand fir/mountain lover habitat type. These sites correspond closely with the ponderosa pine-Douglas-fir/ninebark and white fir/twinflower-forb community types identified by Dr. Frederick Hall in the nearby Blue Mountains.

Seeding of forage in alternate plots as well as cattle and big game grazing followed the design in the previous paper by Wheeler, Krueger, and Vavra. The grand fir/mountain lover habitat type was seeded with the forage mixture and the Douglas-fir/ninebark habitat type was seeded to blue wildrye and to mountain brome.

Distribution of plants within each of the three pastures on the clearcut was determined in July 1977 through sampling for presence of all plant species in a series of 2-square-foot quadrats. Each replication of each treatment was sampled with two transects of 10 quadrats for a total of 150 quadrats examined. Treatments were: two habitat types, three grazing treatments, and four seeding treatments. Differences in frequency of all plant species in each treatment were determined using a factorial analysis of variance and means were separated with Tukey's $\underline{w}$-procedure. All differences referred to in this report are significant at $P<.05$.

RESULTS AND DISCUSSION

During the 1977 sampling, 100 plant species were encountered. Of these, 43 species were present with high enough frequency to permit statistical analysis. Evaluation of plant community change was based on reaction of these 43 species to the various treatments (Table 1).

Table 1. Average percent frequency of 43 plant species according to treatment

SPECIES	Average Percent Frequency						
	Cattle Grazing	Big game Grazing	Dual Grazing	Seeded	Unseeded	Grand fir h.t.	Douglas fir h.t.
GRAMINOIDS							
Tall oatgrass (S)[1/]	53	56	58	71	50	—[2/]	—
Smooth brome (S)	11	14	4	35	3	—	—
Mountain brome (S)	9	14	18	20	12	—	—
Cheatgrass	3	t[3/]	2	t	3	2	2
Northwest sedge	19	29	32	25	29	30	24
Elk sedge	26	66	47	42	53	44	48
Ross sedge	t	9	7	2	6	6	5
Pinegrass	6	14	17	13	11	5	17
Orchardgrass (S)	28	22	24	82	10	—	—
Blue wildrye (S)	33	31	44	73	27	—	—
Small fescue	4	2	3	3	3	2	3
Western fescue	16	23	32	21	28	24	23
Hairy common woodrush	0	7	4	4	4	5	3
Timothy (S)	30	11	20	47	14	—	—
Kentucky bluegrass	38	61	35	38	55	37	49
Tall trisetum	3	8	5	3	8	4	6
FORBS							
Western yarrow	41	50	55	50	45	44	52
Bigflower agoseris	2	2	4	3	2	t	4
Rose pussytoes	2	6	5	4	5	5	7
Heartleaf arnica	26	15	31	25	23	16	31
Broadleaf arnica	2	1	5	2	3	4	2
Canada milkvetch	29	38	26	29	35	49	19
Canada thistle	4	8	2	5	5	5	4
Bull thistle	4	6	2	5	3	3	5
Wood strawberry	36	73	82	60	69	73	57
Blueleaf strawberry	44	86	84	68	77	84	63
Northern bedstraw	3	2	3	3	3	1	4
Peavine	t	3	12	6	4	1	8
Northwest cinquefoil	1	t	2	1	1	2	t
Sheep sorrel	2	3	2	3	2	3	2
Chickweed	1	4	5	4	1	3	3
Western meadowrue	2	1	4	3	2	1	3
White clover (S)	1	4	16	7	7	—	—
SHRUBS & TREES							
Redstem ceanothus	27	6	3	12	12	4	17
Snowbrush	37	12	11	21	18	11	26
Oceanspray	8	1	7	5	6	1	8
Western larch	1	1	2	1	1	1	1
Ninebark	35	13	11	19	20	9	27
Ponderosa pine	2	3	6	4	3	5	4
Douglas-fir	1	2	2	2	1	1	2
Baldhip rose	3	4	3	3	4	3	4
Birchleaf spirea	18	11	7	12	12	6	16
Snowberry	20	9	12	14	13	8	17

1/ (S) - Species seeded in clearcut

2/ Comparison not valid because of confounding with seeding treatment

3/ t = less than 1%

Eight species did not react differentially to habitat type, seeding of forage species, or grazing treatment. These were small fescue, rose pussytoes, broadleaf arnica, bull thistle, sheep sorrel, western larch, Douglas-fir, and baldhip rose. All these plants were minor species throughout the various plant communities on the clearcut and the lack of measured response may be as much a function of the small sample size as their possible independence to the treatments.

In Pasture I, no big game grazing was allowed; cattle and big game grazed in Pasture II. This resulted in a general dominance of shrubs throughout the Douglas-fir/ninebark habitat type in Pasture I. Vegetation changes that indicated suppression of various plants in the area grazed only by cattle when compared to that grazed by cattle and big game suggested the reduction was caused by to competition from shrubs, rather than grazing pressure. Plants that were reduced in frequency by shrub domination included all the sedges, mountain brome, pinegrass, blue wildrye, western fescue, hairy common woodrush, western yarrow, both strawberries, peavine, chickweed, and ponderosa pine.

Grazing by both cattle and big game resulted in a reduction of smooth brome, heartleaf arnica, and oceanspray. Under dual grazing western fescue, cheatgrass, Canada milkvetch, and Canada thistle increased. The weedy plants, Canada thistle and cheatgrass were low in frequency throughout all treatments.

Elimination of cattle grazing and full use by big game (Pasture III) enhanced the environment of Kentucky bluegrass, tall trisetum, peavine, northwest cinquefoil, western meadowrue, and white clover. Elimination of big game with controlled cattle grazing favored timothy, cheatgrass, redstem ceanothus, snowbrush, ninebark, birchleaf spirea, and snowberry.

The habitat types controlled distribution of certain plants. Pinegrass, bigflower agoseris, heartleaf arnica, northern bedstraw, peavine, redstem ceanothus, snowbrush, oceanspray, ninebark, birchleaf spirea, and snowberry were all more abundant on the Douglas-fir/ninebark habitat type. While Canada milkvetch, the strawberries, and northwest cinquefoil were more abundant on the grand fir/mountain lover habitat type, the 28 other plants were not distributed differently on the two habitat types.

Seeding was also a major force in directing development of the various plant communities on the clearcut. Many plants, however, were not influenced by the seeding treatments. These were bigflower agoseris, heartleaf arnica, Canada milkvetch, northern bedstraw, peavine, northwest cinquefoil, and all shrubs except ninebark. All seeded species were most abundant in plots where they were seeded and, additionally, western yarrow favored this situation. Seeded species dispersed into unseeded areas to a limited extent, but only tall oatgrass dispersed extensively. Seeding did not exclude any resident graminoids but reduced the frequency of mountain brome (on the grand fir/mountain lover habitat type), elk sedge, ross sedge, pinegrass, western fescue, Kentucky bluegrass and tall trisetum. Of the forbs, only the strawberies, peavine and Canada milkvetch were depressed by seeding. Ninebark frequency also was higher in unseeded locations. Responses of forbs and shrubs related to seeding were valid, but absolute differences were not great.

CONCLUSIONS

1. Each treatment or combination of treatments directed plant succession toward a different mixture of plant species. To some degree, plant succession can be managed to produce a predetermined plant community.

2. Habitat type influences directed development of plant communities independent of other treatments but more than half the species were not differentially influenced by habitat type.

3. Big game grazing had more influence on succession than cattle grazing probably because of the interaction with shrubs and their domination of the Douglas-fir/ninebark habitat type.

4. Seeding of introduced species did not reduce distribution of shrubs or most forbs and only tall oatgrass moved into unseeded areas in large amounts.

CATTLE GRAZING POTENTIAL ON CLEARCUTS

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Previous reports have indicated the need for integrating forest and livestock production in the Northwest. This study was conducted to evaluate potentials for beef cattle production on clearcuts. The clearcut studied has been described by Wheeler, Krueger, and Vavra in a previous paper. The 5-acre pastures had been grazed by cattle since 1966. Cattle were stocked at the rate of five yearlings per pasture per month. Grazing was initiated each year from June 25 to July 15 and lasted for one month. In this study, Pasture I (big game excluded) and Pasture II (grazed in common by cattle and big game) were used.

EXPERIMENTAL PROCEDURE

Five steers, two with esophageal fistulas and two trained to carry total fecal collection devices grazed each pasture. The grazing season lasted from July 6 to August 9, 1972, and from July 13 to August 10, 1973. The grazing period was shorter in 1973 because of drought conditions. Two esophageal fistula collections and two 24-hour fecal collections were made per week during the grazing periods. Diet samples collected from esophageal fistulated animals were analyzed for crude protein, acid detergent fiber, lignin, and *in vitro* digestiblity. Total fecal collections were used in estimating dry matter intake. Additionally, diet samples were analyzed for plant species composition to determine animal preference.