UNDERSTORY VEGETATION CHANGE FOLLOWING CUTTING OF WESTERN JUNIPER IN GRANT COUNTY, OREGON

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SUMMARY

Plant response to juniper tree cutting was compared with adjacent uncut plots in Grant County, Oregon. The study area was a closed juniper woodland with overstory trees ranging in age between 70 and 90 years. Measurements were recorded before treatment in 1992 and after treatment in 1993 and 1995. Response of Idaho fescue and bluebunch wheatgrass were minimal and were probably due to initial densities being less than one plant per 10 ft^2. However, squirreltail and perennial forbs, which had initial densities of near or greater than one plant per 10 ft^2, increased following cutting. Densities of all shrub species before treatment were too sparse to show a measurable response in the third post-treatment year.

INTRODUCTION

The decision to remove an overstory of western juniper (*Juniperus occidentalis*) on any site or landscape should be based on a number of site factors, including quantitative data on age/size classes of trees, degree of stand closure, soil characteristics, and available understory plant resources. Understory species composition and density are dominant factors determining vegetation response following cutting. In addition, the rate of response will also be controlled by a multitude of abiotic and biotic factors. However, there are few studies to serve as guides for prediction of understory vegetation response. Of particular concern are thresholds of desirable plant species abundance, below which there is little response after treatment. When desired species are incapable of responding, a vegetation state dominated by undesirable annuals or alien species may develop.

This study provides useful guidelines for expected understory response after cutting of western juniper. Although responses reported only extend across three growing seasons immediately following treatment, the rate of change typically slows after three years as the sites resources are largely reallocated in this time frame.

STUDY AREA

The study area was located in Grant County near Mount Vernon. The site is dissected by a second-order drainage generally flowing south-westerly. The upper elevation of the study was approximately 4300 ft elevation, against the ponderosa pine zone, and extended downward to approximately 3200 ft elevation. The two opposing sides of the drainage have general aspects of NW and SE respectively. Occasionally, juvenile ponderosa pines were found on those plots with a NW aspect but not on plots of the opposing SE aspect. Regional precipitation during the study was below average in 1992, 1993 was wet, while 1994 and 1995 were near average years.

The NW aspect has been mapped (USDA, Soil Con. Ser. 1981) as a Snell-Anatone complex. These are both stony loams ranging from 11 in. deep (Anatone) to 23 in. deep (Snell) overlying

basalt. The soils on the SE aspect were mapped as a Lickskillet-Rock outcrop complex. The Lickskillet series, which strongly dominates this particular area, is an extremely stony loam about 15 in. deep to basalt.

The plant community before treatment was a western juniper overstory and a Sandberg bluegrass-annual understory. Given the elevation, amount of precipitation (estimated to be roughly 16 in.), soils, remnant vegetation, and vegetation of similar sites, the historic plant community on the NW aspect was most likely dominated by Idaho fescue. Estimated composition based on production for the historic community is Idaho fescue 60%, bluebunch wheatgrass 10%, mountain big sagebrush 10%, perennial forbs 10%, and Sandberg bluegrass, other bluegrasses, squirreltail, junegrass, and antelope bitterbrush all at about 2% each. The SW aspect was likely a bluebunch wheatgrass community with the following expected historic composition of bluebunch wheatgrass 50%, Idaho fescue 10%, Thurber needlegrass 5%, mountain big sagebrush 5%, Sandberg bluegrass 3%, and antelope bitterbrush 2%.

METHODS

Vegetation Measurement

Three paired plots were located on each side of the main drainage for a total of 12 plots (6 plots on each aspect). One of the plots within each of the six pairs was randomly selected for cutting. Western juniper trees on the selected plots were cut by chainsaw during the fall of 1992 and winter of 1993 and left whole on the ground. Plots varied in size, ranging from 12 to 25 acres. Vegetation measurements included understory cover (percent of canopy estimate) and density (number of individuals counted in meter square sample plots) in the summer of 1992 before treatment and again in the summers of 1993 and 1995 after treatment. Sample plots were located along ten random lines in each of the 12 plots. Western juniper cover was measured in the summer of 1992 with the line intercept method along three 60-m transects in each of the 12 plots. Tree density was measured in three 6x60-m belt transects in each plot. Vegetation data reported here includes data from the 1992 pre-treatment and the third year post-treatment, 1995.

Wildlife

Composition and abundance of small mammals and birds were measured in the three plot pairs located on the NW aspect during three summers following treatment. These results are reported in two papers presented in this publication.

RESULTS

Pretreatment Plant Measurements

In 1992 we estimated western juniper cover at 42% across all plots with no differences between plots. This was a closed, even-aged woodland with dominant overstory trees varying between 70 and 95 years in age. Suppressed sapling trees (< 12 ft tall) in the understory ranged in age from 45 to 60 years. Recruitment of young trees was rare, with juvenile tree density < 15/

acre and displaying suppressed leader growth. Fruit production across the stand was scarce. Tree density was 122/acre across the NW aspect plot and 102/acre across the SE aspect plots.

Bare ground and western juniper accounted for the majority of cover across all plots (Fig. 1). Litter cover was nearly 30%. However, over 80% of the litter was juniper needle mat located beneath the tree canopies. Total herbaceous plant cover was about 10% and not different between the two aspects. However, components of the herbaceous vegetation shifted in importance with aspect. Sandberg bluegrass, other perennial grasses, and perennial forbs were important components on the NW aspect while Sandberg bluegrass and annual forbs were most important on the SE aspect (Fig. 2). Sandberg bluegrass consistently made up over 2/3s of the perennial grass component on both aspects. Shrubs were noticeably scarce and seldom encountered in sampling.

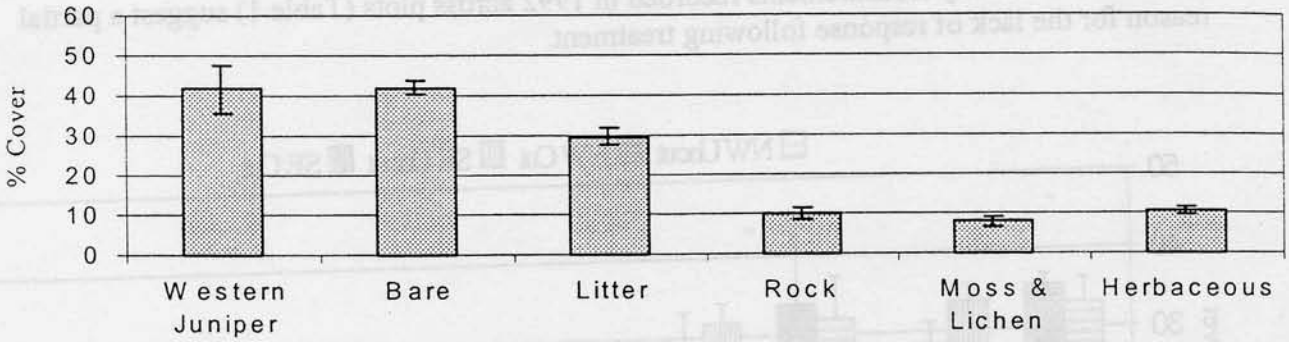

Figure 1. Pretreatment surface cover (%) in major catagories.

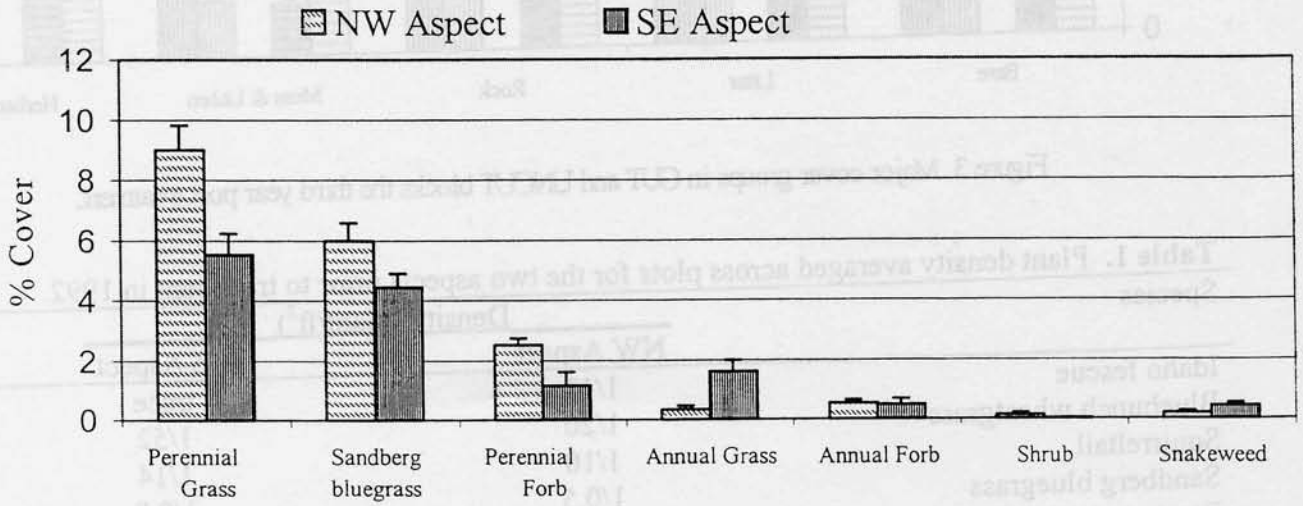

Figure 2. Pretreatment ground cover (%) by major plant groups and species.

Post-treatment Plant Measurements

Total perennial grass cover on the NW aspect and Sandberg bluegrass cover on both aspects declined on the uncut plots between 1992 and 1995. Other components were not different. Cut plots showed less moss and lichen cover and greater herbaceous cover than uncut plots for the NW aspect, however, other components were not different (Fig 3). As to the herbaceous components, cut plots on the NW aspect resulted in a higher cover of perennial grass, perennial forb, annual grass, annual forb, and snakeweed than did the uncut plots (Fig. 4). Cut plots on the SE aspect resulted in less Sandberg bluegrass but greater annual grass and snakeweed cover compared to uncut plots. Sandberg bluegrass contribution to perennial grass cover had dropped to approximately 30% in 1995 on cut plots.

Cover response by herbaceous perennial components to cutting of western juniper was not spectacular. Density measurements recorded in 1992 across plots (Table 1) suggest a partial reason for the lack of response following treatment.

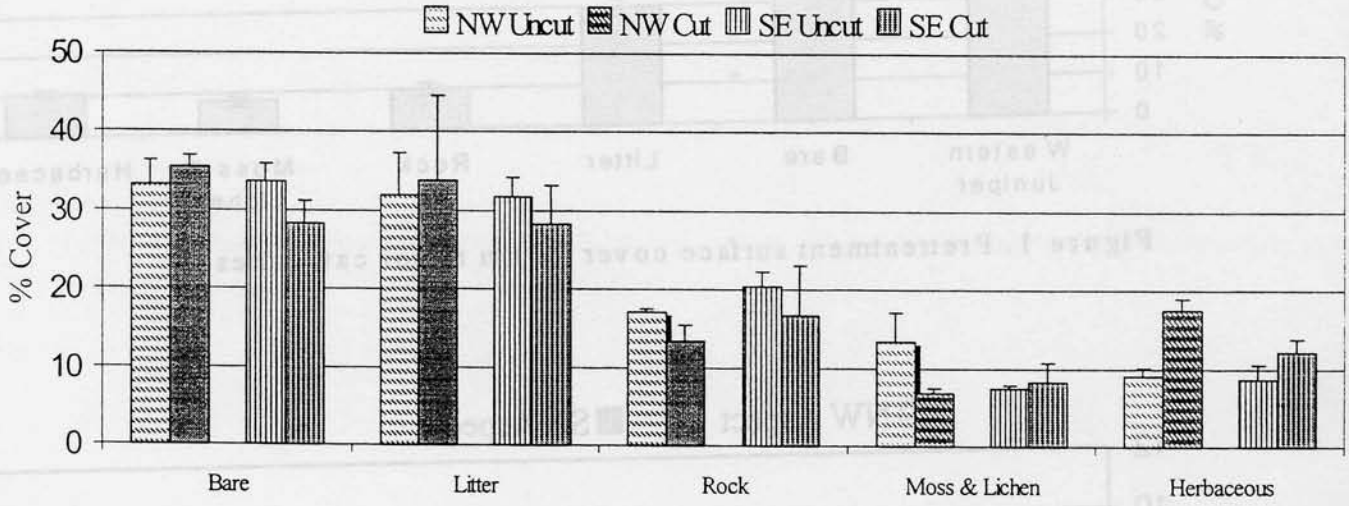

Figure 3. Major cover groups in CUT and UNCUT blocks the third year post treatment.

Table 1. Plant density averaged across plots for the two aspects prior to treatment in 1992.

Species	Density (plant/ft^2)	
	NW Aspect	SE Aspect
Idaho fescue	1/13	trace
Bluebunch wheatgrass	1/20	1/52
Squirreltail	1/10	1/14
Sandberg bluegrass	1/0.5	1/0.8
Erect perennial forbs	1/3	1/8

In uncut plots in 1995, density of Sandberg bluegrass plants had declined 40% on the NW aspect while erect perennial forbs had nearly doubled on both aspects. Annual grass density had also increased. Cut plots showed a 2 to 3 fold increase in squirreltail and a 3 to 4 fold increase in erect perennial forb densities on the two aspects. Mat forming perennial forbs also increased 2 to 3 fold. Although individuals of mat formers are difficult to separate, new juveniles were particularly abundant for western yarrow. Sandberg bluegrass showed a 50% decline in density on both aspects. Annual grass density tended to increase 1 to 2 orders of magnitude.

CONCLUSIONS

Juniper establishment peaked between 1900 and 1920 with little tree recruitment occurring after 1945 across the study site. Suppressed leader growth on understory trees suggested the woodland was closed (trees fully occupied the site, see Table 2 in "Understory Dynamics...", in this publication). The relatively low response by Idaho fescue and bluebunch wheatgrass to the removal of western juniper is likely due to a combination of insufficient numbers of individuals as well as inadequate time to respond. Measurable responses were not evident for either numbers of individuals or for cover. Numbers less than one per 10 ft^2 may represent a threshold in measurable plant response and additionally may be too few to produce sufficient seed to repopulate the area. Squirreltail, however, can be a prolific seed producer compared to Idaho fescue and bluebunch wheatgrass, particularly following disturbance. Post-treatment squirreltail numbers increased following juniper treatment. This species had an initial density near 1 per 10 ft^2, which had increased on cut plots in 1995 to 1 per 4 ft^2 on the NW aspect and to 1 per 5 ft^2 on the SW aspect. Perennial forbs as a group had densities greater than 1 per 10 ft^2 before treatment and these also increased significantly. Shrubs of all species were too sparse to show measurable increases in cover, and insufficient time had probably elapsed for new individuals to appear. However, snakeweed, which is a half/shrub increased in numbers and cover after cutting.

LITERATURE CITED

USDA Soil Conservation Service. 1981. Soil Survey of Grant County, Oregon, Central Part.

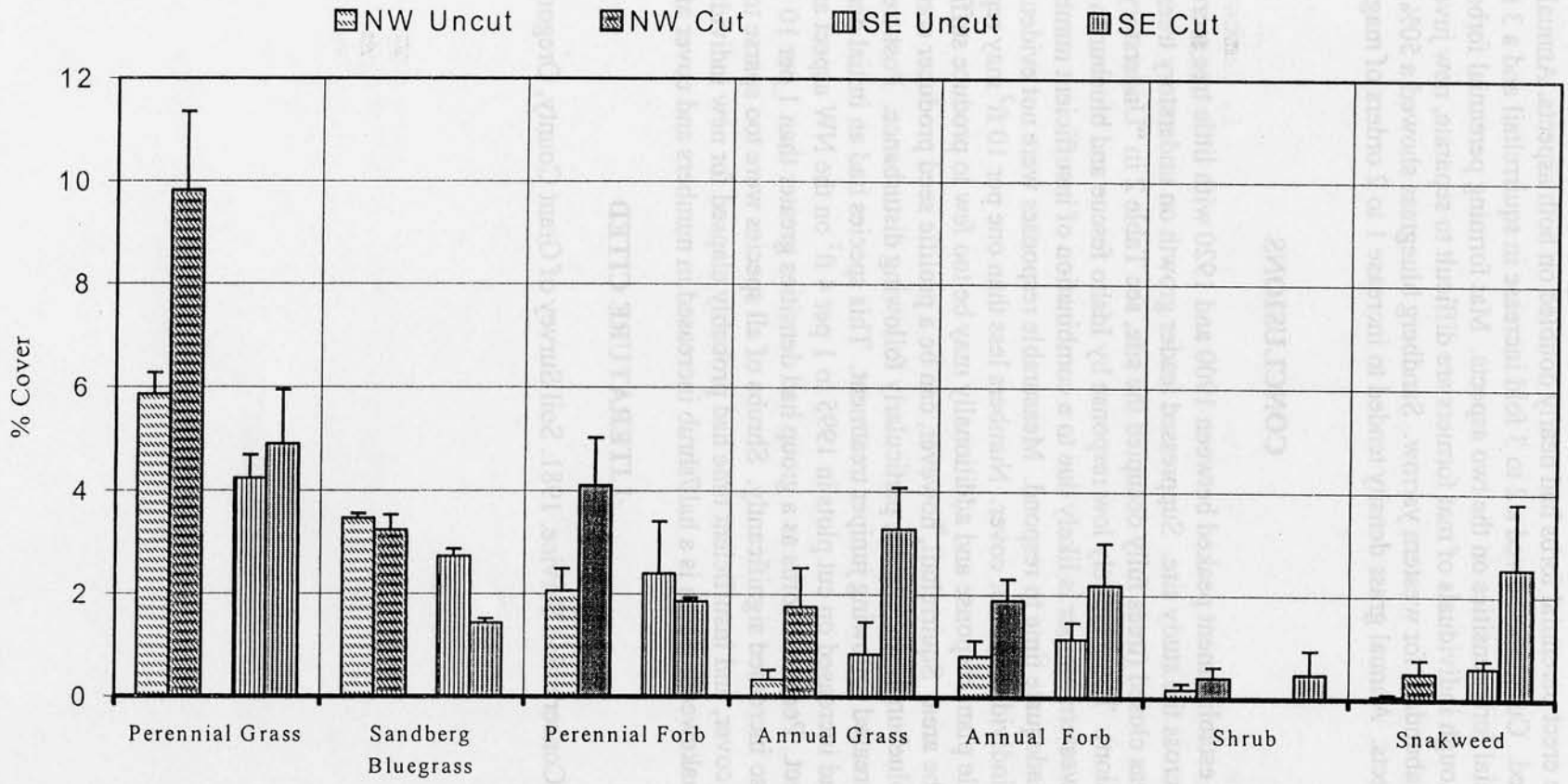

Figure 4. Plant cover by functional groups and species on UNCUT and CUT blocks the third year post treatment.