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SOIL AND VEGETATION RESPONSE TO PRESCRIBED BURNING FOR WINTER RANGE ENHANCEMENT

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INTRODUCTION

Prescribed burning for winter range enhancement has occurred since the 1960's in the 50,000 acre area along the lower Selway River on the Nez Perce national Forest in north central Idaho. Much of the area burned in wildfires of 1910, 1919, and 1934. Grand fir and western red cedar habitat types dominate these slopes, but much of the existing vegetation is early seral shrubfields generated by past fire. These have been key elk winter range. In 1991 in cooperation with the University of Idaho and the Rocky Mountain Elk Foundation, a study was designed to address the following questions:

- >Did summer burning result in increased numbers of seedlings or sprouts of preferred browse species
- >Did the response in vegetation vary by aspect or elevation
- >Did elk use increase after burning
- >Did elk use vary by aspect or elevation
- >At what age did any desirable vegetation response or elk use decline
- >How did soil properties change with burning, and how did they change over time
- >Did soil response to burning vary by aspect or elevation

The objective of this study was to develop burning guidelines for frequency, elevation, soil, or aspect where burning both elicited a favorable browse response, was used by elk, and where soil productivity could be maintained.

METHODS

The area was stratified into 3 elevation zones, 2 aspects, and 5 burn years that included sites from 2 to 150 years or more. Not all combinations of elevation, aspect, and age were available.

On 64 representative sites, the following data were collected:

- >Deer and elk pellet group counts in 20 randomly located 10m² plots.
- >Counts of Scouler willow stems and redstem ceanothus seedlings and sprouts in 20 4m² plots.
- >Descriptions of physical site features and plant community composition and structure using USFS Region 1 ECODATA methods.
- >6 soil samples, each separated by component: litter, humus, soil wood, and mineral soil to a depth of 6 inches.

ANALYSIS AND RESULTS

Means of pellet count, browse density, and soil organic matter data were computed for each site. Data were plotted against elevation and age since burn, using aspect

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to label data points. Data were analysed using SYSTAT with a two-way analysis of variance, using age and aspect as categorical variables, and elevation as a covariate.

Vegetation data were summarized by site and sampling stratum using USFS Region 1 ECOPAC programs.

>Density of preferred browse species differed by burn year. Within the burn years sampled, 6 year old burns had greatest browse canopy cover, but seedling density was highest on 2 year old burns. Scouler willow was more abundant at higher elevations, but redstem was not sensitive to elevation. Neither species was sensitive to aspect. Available browse had declined in 25 year old burns, as trees became established and shrubs grew out of reach.

>Elk pellet groups indicated highest elk use on 6 year old burns, and decreased use at 25 years or more after burning. Elk use appeared to be highest at mid (3000-4500 feet) elevations but this was not statistically significant.

>White-tail deer pellet counts were highest in burns more than 60 years old. They tended to be highest in the 2000-3500 feet elevation zone, but this was not statistically significant.

>Areas of highest elk use were associated with high cover of redstem and Scouler willow. White-tail deer were more highly associated with older burns with high shrub and tree cover, but more general in browse preferences.

>Total soil organic matter differed by burn year. Sites burned in 1910 or 1934 had not recovered levels found in older stands. Soil wood was generally absent, even in stands 80 years old or more. This may suggest a history of repeated fire, since soil wood is an important component of most grand fir and western red cedar sites. Total soil organic matter did not vary by aspect or elevation.

>Soil litter had recovered levels similar to older stands by 60 years. Elevation did not significantly affect litter levels or rates of change. Litter was greater on north aspects than south for recent burns, but this difference disappeared by 50 to 80 years, and increased with elevation.

CONCLUSIONS

Preferred browse species have responded favorably to the summer prescribed burning program, and elk have used the burned areas more than older stands. Burning appears to be effective throughout the 2000 to 4500 feet elevation sampled. North aspects are generally as favorable as south aspects for browse response and elk use. By 25 years, elk use had declined, and in 80 year old burns, elk use had returned to that typical of forest stands 125 years old or more.

Soil organic matter levels are decreased by burning and by 25 years have not recovered levels typical of forest stands 125 years old or more. A mean natural fire frequency of 25 to 30 years would be extremely short in grand fir or western red cedar habitat types. Fifty to more than 200 years is more typical. Barrett found for the Cook Mountain area of the adjacent Clearwater National Forest mean natural fire frequencies of 10 years in grand fir habitat types, where shrubfields have apparently persisted for 200 years or more. It is possible that soil degradation has occurred on the Selway sites as a result of a single or multiple catastrophic events; the usual volcanic ash surface layer is generally absent. This may favor persistence of a fire-shrubfield dysclimax.

The lack of soil wood and organic matter maintained at chronically low levels by frequent fire could be expected to affect mycorrhizal activity, nitrogen fixation and other soil processes.

A more local fire history that examined a longer time frame could document the natural fire regime in this area, to determine if the proposed 15 to 30 year fire rotation falls within the natural range. Paired comparisons of the Selway burn area and adjacent wilderness shrubfields would allow comparisons between the soil properties under frequent prescribed burns and in a similar system under a natural fire regime.' (μR#(-27<AFK