On crested wheatgrass foothill range, yield increases attributed to spraying averaged about 531 pounds per acre. This response should last through the 15th post-treatment year with an effective spray treatment. Given this response, a maximum spraying cost of about $31 per acre is justified.

SEASONAL FLAMMABILITY OF BIG SAGEBRUSH AND WESTERN JUNIPER FOLIAGE

P. Hefner, R. G. Clark, and C. M. Britton

Fuel moisture changes and the resultant effect on relative flammability of sagebrush and western juniper foliage represent important parameters in predicting success of prescribed burns. Little is known about big sagebrush and juniper foliage moisture and their seasonal patterns. For most species, early spring represents a low foliage moisture content which increases as the growing season progresses. This is followed by decreasing foliage moisture during the dry period which persists until late summer or until fall precipitation.

This study was initiated to determine the seasonal change in foliage flammability indices. Associated foliage moisture and soil moisture contents also were studied to document seasonal patterns and their relation to flammability.

METHODS AND PROCEDURES

This study was initiated in the spring of 1978 and conducted at the Squaw Butte Range located 40 miles west of Burns, Oregon while the 1979 data were collected from plots five miles north of Hines, Oregon. Foliage samples, soil moisture samples, and ignition times were collected bimonthly from April 1 to October 1 of 1978 and 1979.

Ten individual plants of juniper and big sagebrush were marked and samples of the terminal four inches of branches were removed for evaluations. Subsamples were weighed, oven dried, and weighed to determine moisture content.

Flammability testing consisted of duplicate subsamples being burned in a propane burner at a given height above the flame. Subsamples were timed to determine the length of preheating required for ignition. At time of sample collection, soil samples were taken in the surface 10 inches for gravimetric determination of moisture content. All data were averaged over the two study years.

RESULTS AND DISCUSSION

Actual foliage moisture content of both species varied over the study period but followed the same basic curve (Figure 1). Juniper moisture content ranged from a low of 63 percent to a high of 98 percent. The lows occurred early in the spring and again late in the fall. This curve indicated that even lower moistures might occur during winter. Big sagebrush followed the same pattern with low moisture contents in spring and fall with a peak in early summer. This range in moisture content was considerably greater than juniper, 50 percent for a low and 155 percent for a high. This indicated the optimum burning period to be late summer to early fall, for both species, with a possibility for early spring burning.

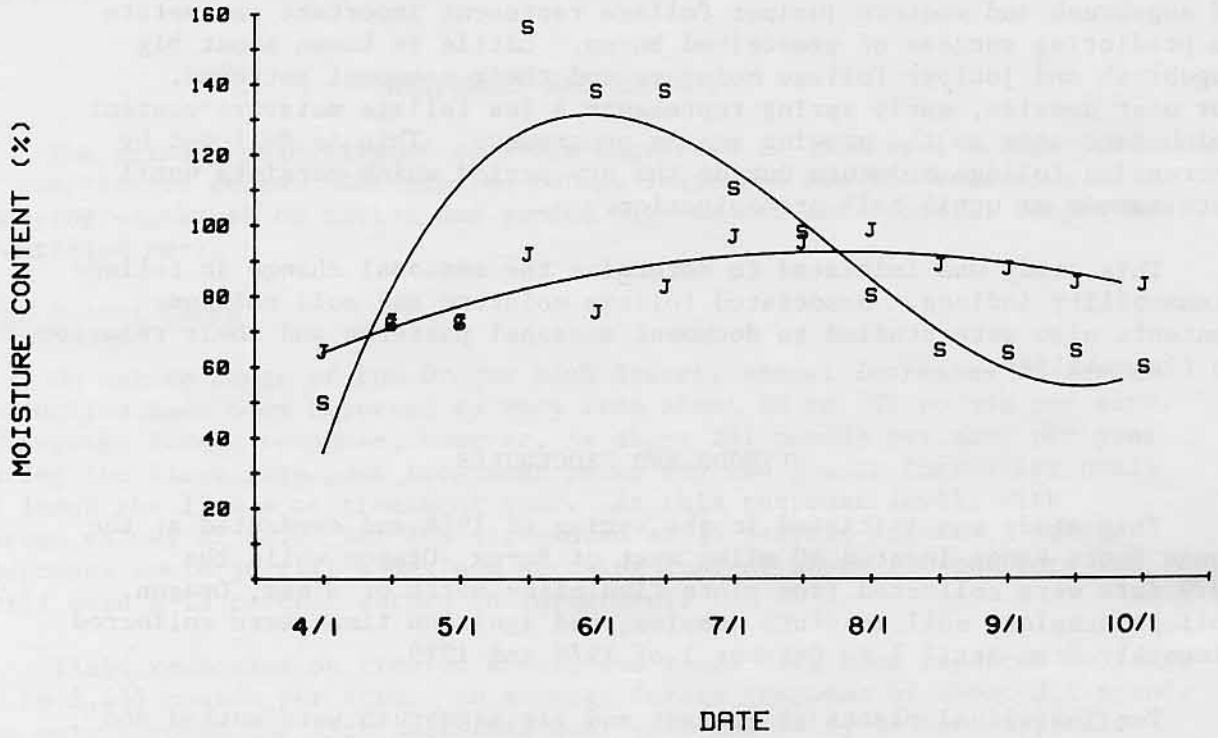

Figure 1. Changes in percent foliage moisture content of big sagebrush (S) and western juniper (J) averaged over 1978 and 1979.

Ignition index for juniper and big sagebrush foliage exhibited seasonal variations (Figure 2). Big sagebrush ignition time was high at 40 to 50 seconds from early May to mid-June and decreased rapidly to less than 20 seconds from early July to October. Short ignition times also were measured in early April. A similar pattern of change was seen in sagebrush foliage moisture content and a good degree of correlation (r=0.66) was apparent.

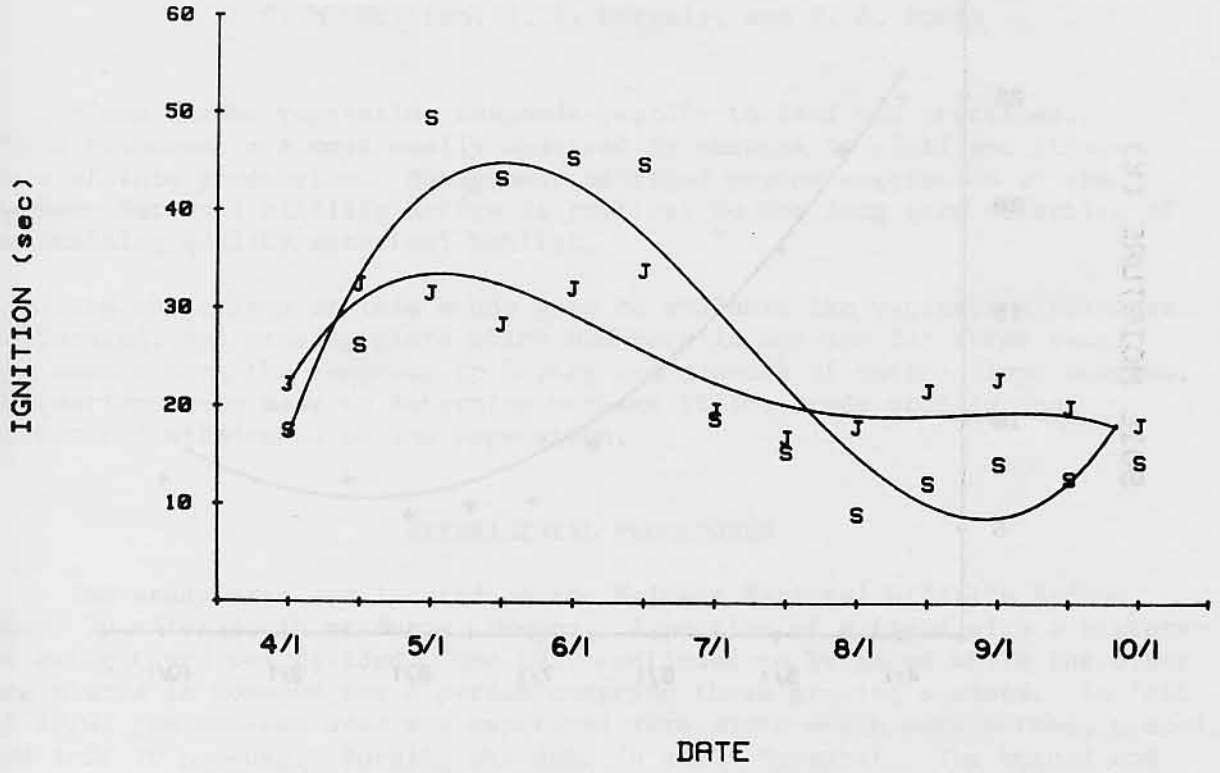

Figure 2. Foliage ignition indices as measured in seconds for big sagebrush (S) and western juniper (J) averaged over 1978 and 1979.

The change in ignition index for juniper was smaller than for big sagebrush, although the pattern was similar. This smaller degree of change also was apparent in the foliage moisture content. Air temperature was an important factor in juniper ignition. As air temperature increased the ignition time decreased which was reflected in a correlation coefficient of r=-0.72. This impact of air temperature was not reflected in big sagebrush ignition.

Soil moisture content is the driving force of foliage moisture content. This is only true during the growing season. Soil moisture was high in early April (Figure 3), but the plants had not started active growth and their moisture contents were low. By mid-May, foliage moisture was high which accounted, in part, for the decreasing soil moisture. This relationship was most apparent for big sagebrush. Through the summer dry period, soil moisture continued to decrease until precipitation in mid-August.

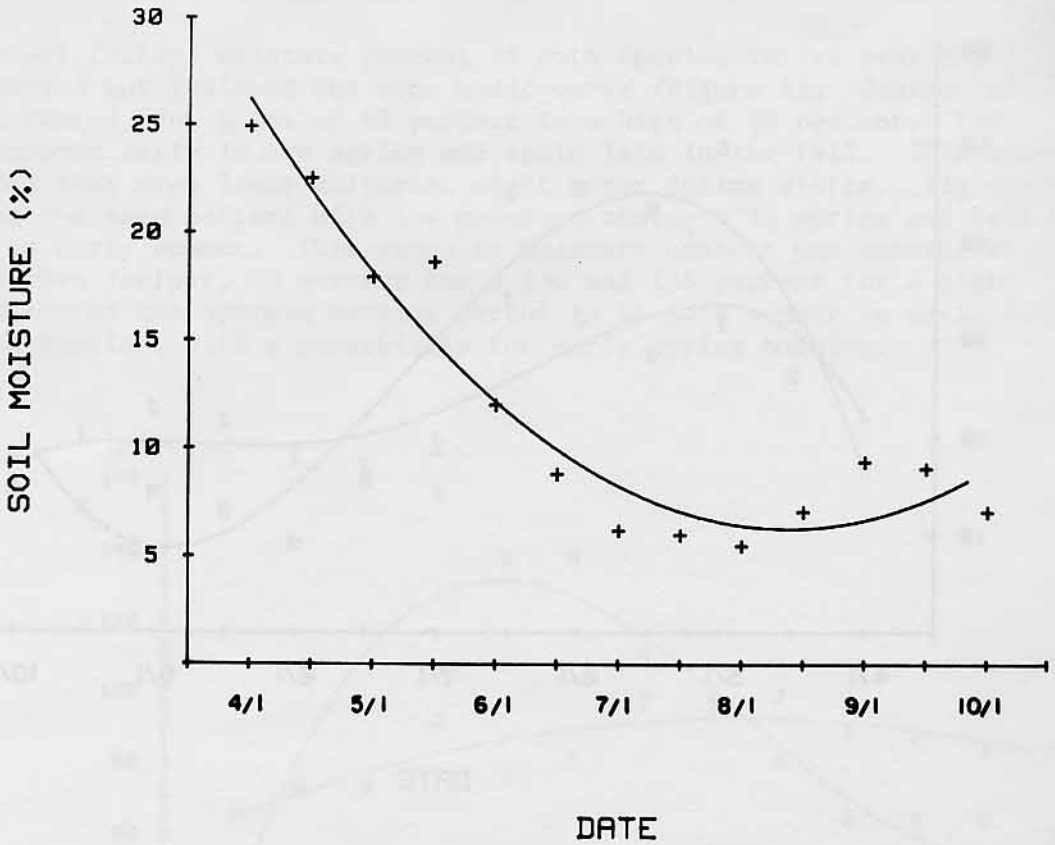

Figure 3. Percent soil moisture of the surface 10 inches averaged over 1978 and 1979.

Results of this investigation indicate that highest ignition probabilities and the possibility of conducting prescribed burns begin in early-July and continue into October. Even though soil moisture is high in April, ignition times indicate a short of time is suitable for conducting prescribed burns.