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Elk-Aspen Relationships on a Prescribed Burn

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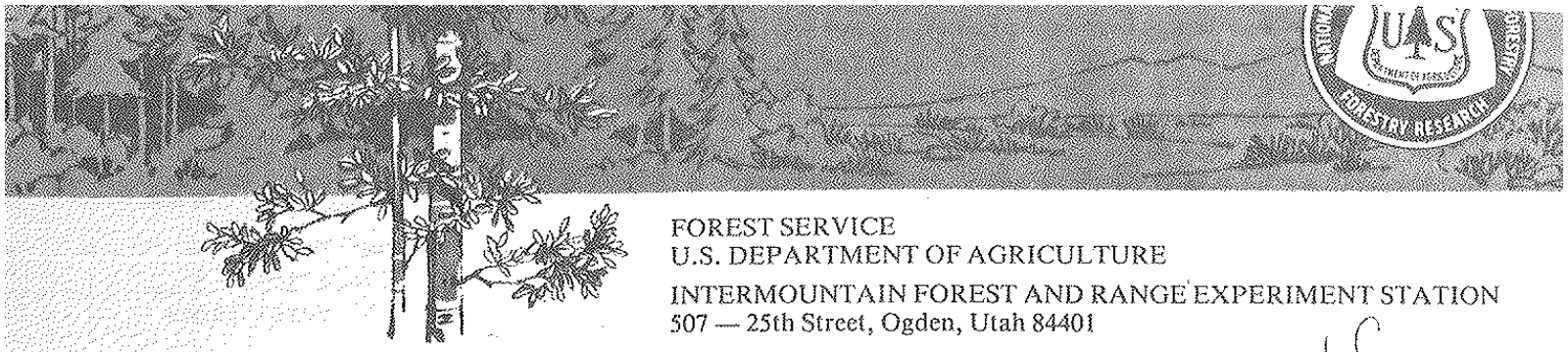

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ELK-ASPEN RELATIONSHIPS ON A PRESCRIBED BURN[1]

Joseph V. Basile[2]

ABSTRACT

Elk use of aspen clones was deterred only one winter following prescribed fire. Numbers of aspen suckers on the nine burned clones increased 178 percent in 3 years, but the response varied greatly among clones. Elk browsing the third winter after burning averaged 44 percent of current annual growth, and eliminated incremental height growth from the previous summer. It is not yet known whether prescribed burning can rejuvenate decadent aspen stands under existing elk browsing pressures.

KEYWORDS: elk, aspen, fire

The decline in aspen (*Populus tremuloides* Michx.) and the paucity of successful regeneration has concerned resource managers in the Jackson Hole area of northwestern Wyoming for several decades. This decline generally has been attributed to overbrowsing by elk (Murie 1944; Beetle 1962). Gruell (in press), however, raised the question of whether fire suppression might be equally responsible for the aspen decline. He has described the historic role of wildfire in creating and maintaining vigorous aspen stands, and he has expressed the belief that prescribed fire can rejuvenate decadent stands despite existing levels of ungulate use.

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[1]This paper was presented at the Elk Ecology and Management Symposium, April 3-5, 1978, Univ. of Wyo., Laramie.

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Bartos and Mueggler (in press) described an experimental burn of aspen clones on the Gros Ventre winter range, and reported initial effects of the fire on forage production. I will report on the effects of that burn on elk use of the area, on aspen suckering, and on elk use of those suckers.

Methods

Counts of aspen suckers in each of the 10 clones were from five 4-m^2 (43-ft^2) microplots nested within each of four 100-m^2 (1,076-ft^2) macroplots. Since 1974, I have assessed elk use by pellet group counts on eight 0.004 hectare (0.01 acre) plots per clone each spring.

Elk Use

Gruell (personal communication) reported pellet group counts on the study area in 1972 and 1973 as 622 and 787 per hectare (252 and 318 per acre), respectively. My sampling in 1974 showed 1,041 pellet groups per hectare (421 per acre), which together with Gruell's findings indicated an average preburn density of approximately 812 groups per hectare (329 per acre).

Burning in the late summer of 1974 rendered the area relatively unattractive to elk in the ensuing few months, as is evidenced by the 279 pellet groups per hectare (113 per acre) counted in the spring of 1975. But elk use returned to preburn levels in the second and third postburn winters, when pellet groups numbered 978 and 724 per hectare (396 and 293 per acre), respectively. This pattern of elk use--that is, the first-year decline from, but rapid return to preburn levels--was fairly consistent among the 10 aspen clones (fig. 1 and 2).

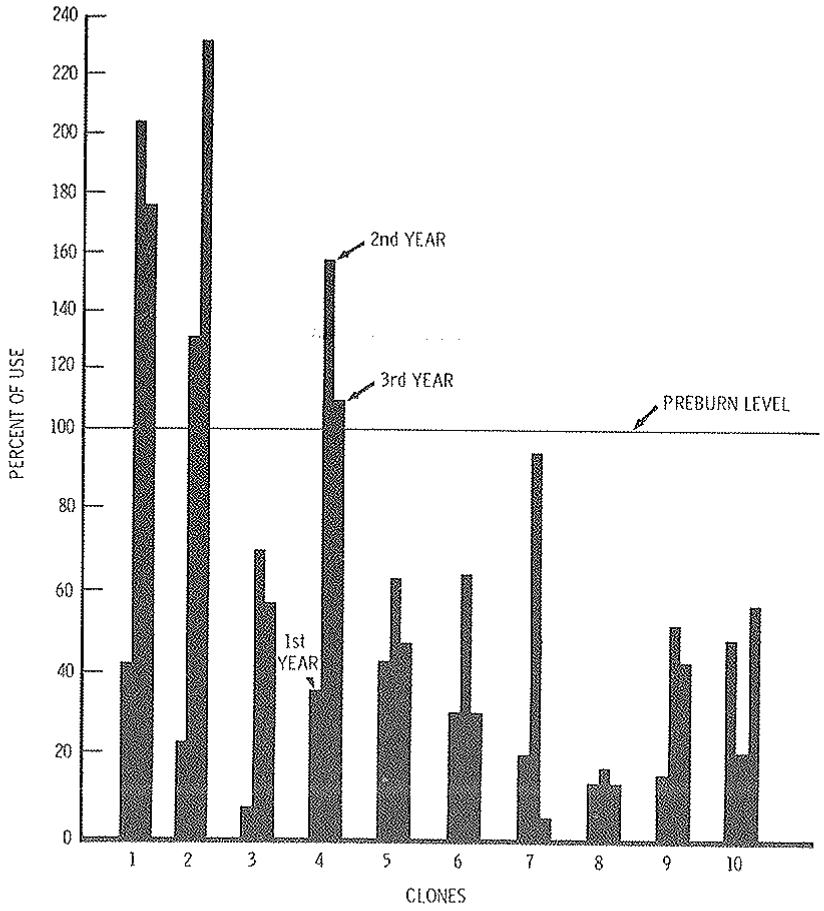

Figure 1.--Pattern of elk use on 10 aspen clones in three consecutive years after burning, expressed as a percentage of use in the year before the fire.

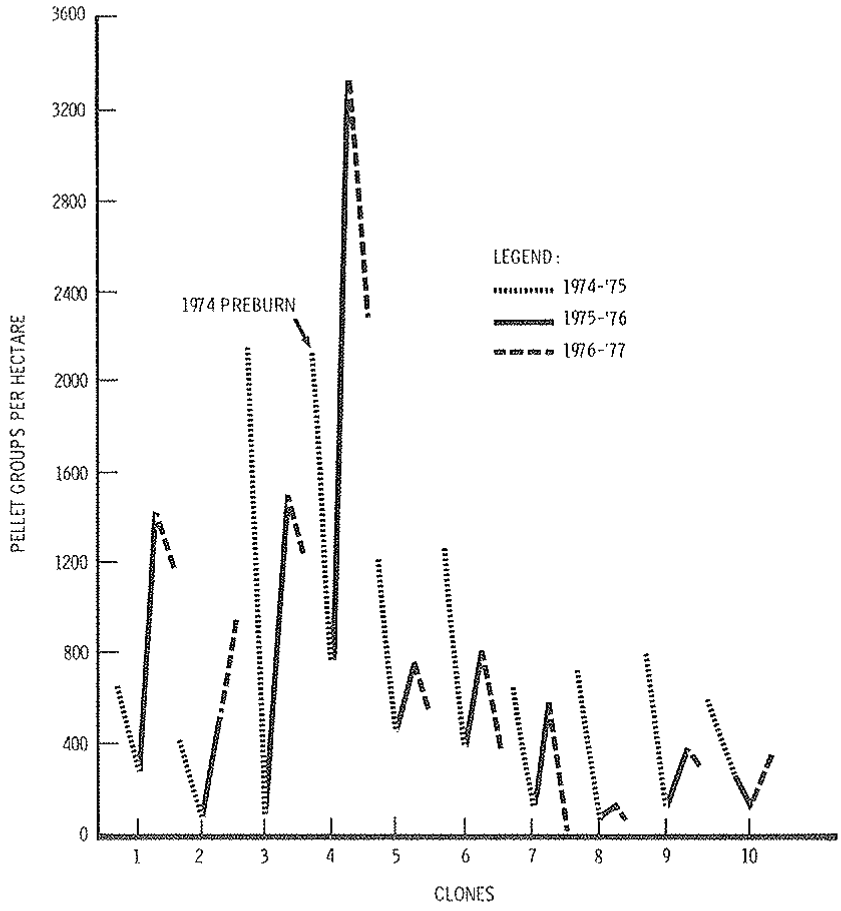

Figure 2.--Pellet group counts on 10 aspen clones in one preburn and three postburn years.

Sprout Production

How did the fire affect aspen suckering? The year after the fire, the nine burned clones averaged an 87 percent increase in suckering, but the response was by no means uniform (fig. 3). Suckering decreased 62 percent on one clone (No. 4), remained unchanged on three clones (Nos. 3, 6, and 9), and increased on a fifth clone (No. 1) by only half the percentage rate that suckering on the control clone (No. 10) did. Thus, suckering on only four burned clones (Nos. 2, 5, 7, and 8) increased proportionately over that of the control in the first year; however, a somewhat more uniform response was noted in the second and third years. These same four clones continued to outperform the control. In addition, two of the other clones (Nos. 3 and 6) showed a greater percentage increase over the preburn suckering levels than the control showed. The percentage increase in suckering on aspen clones No. 4 and No. 9 never did exceed that on the control; however, suckers on clone No. 4 did number in excess of 30,000 per hectare (12,140 per acre) in the second and third years.

No clear reasons emerge for the differing responses among aspen clones, but conjecture points to several possibilities, including preburn vigor of the clones, density of parent stems, and intensity and completeness of burn. Hopefully, additional analyses will help us assess the effects of those variables.

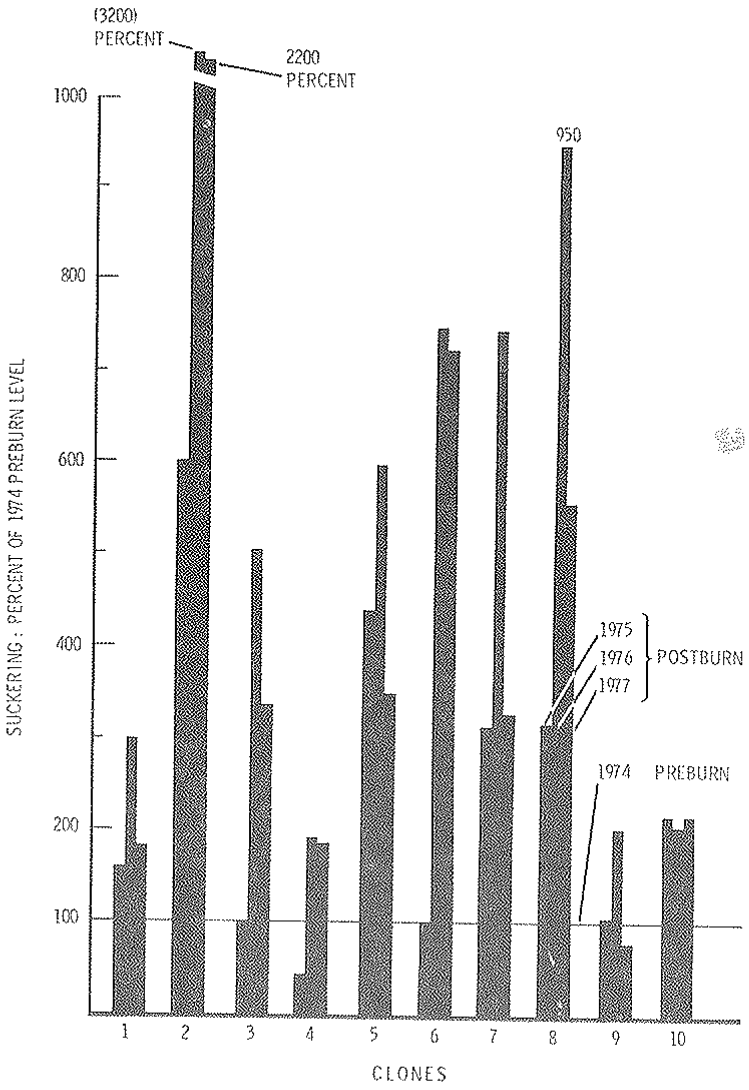

Figure 3.--Postfire aspen suckering (1975-1977) on nine burned clones and one unburned clone (No.10) expressed as a percentage of preburn (1974) levels.

According to Jones and Trujillo (1975), clonal differences in aspen have been reported for susceptibility to a major decay fungus (Wall 1971), for susceptibility to frost damage (Egeberg 1963), and for suckering ability and optimum conditions for suckering (Barnes 1969, Farmer 1962, Tew 1970). It appears plausible then that genetic variation also may contribute to clonal differences in response to fire; therefore, caution is necessary in interpreting results, for the one control clone (No. 10) may not represent a good standard for comparing results on the nine burned clones.

Sucker numbers on the unburned control increased from a preburn level of 8,500 per hectare (3,440 per acre) to a relatively constant level of approximately 18,600 per hectare (7,527 per acre) in the first three postburn years (fig. 4). The reason for this increase is unknown. On the nine burned clones, average numbers of suckers per clone increased from a preburn 6,200 per hectare (2,509 per acre) to 11,600, 28,000, and 17,200 per hectare (4,694, 11,332, and 6,960 per acre) in the next 3 years. Sucker numbers on all nine aspen clones were greatest 2 years after burning. Although they dropped in the third year, they still exceeded the preburn numbers on all clones except one.

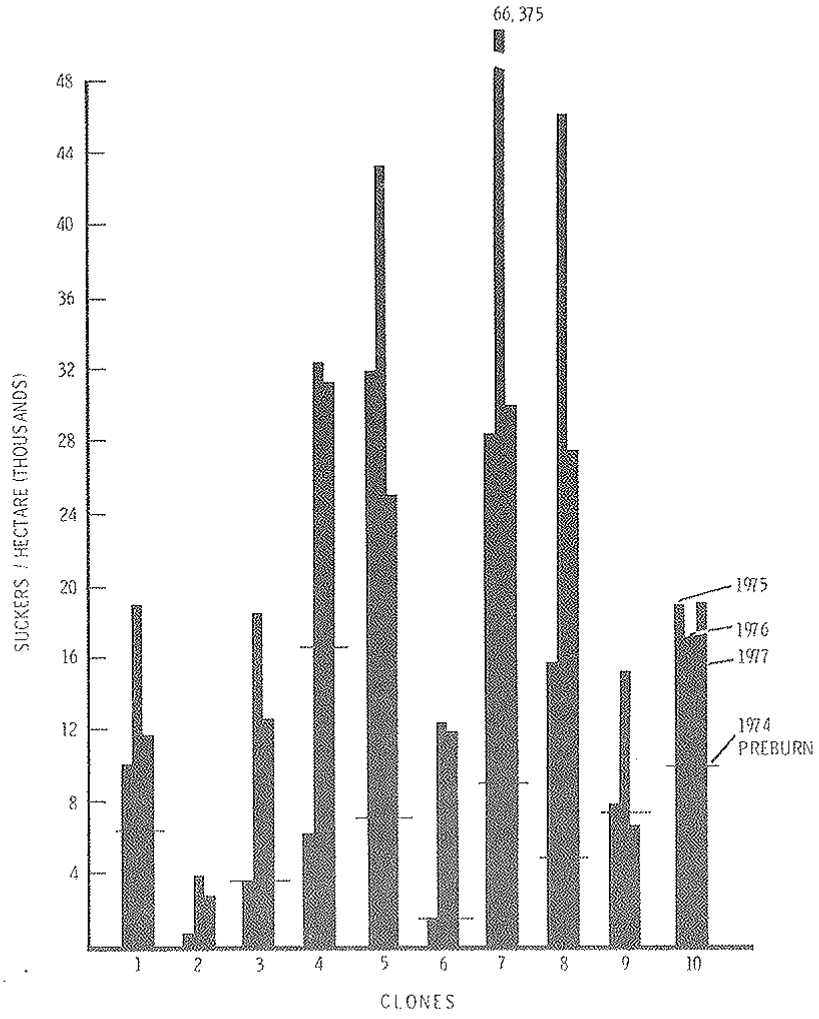

Figure 4.--Aspen suckering before (1974) and after the fire (1975-1977) on nine burned clones and one unburned clone (No. 10).

Overall, sucker numbers on the burned clones increased 178 percent in 3 years, as opposed to 119 percent on the unburned clone. The net effect of burning appeared to be beneficial to suckering.

But numbers alone do not spell success. These aspen stands will regenerate successfully only if a sufficient number of suckers can attain a height at which their leaders are no longer vulnerable to browsing.

The extent of leader damage was determined each spring on eight plots in each clone. Percentage of leaders browsed dropped from a preburn 80 percent to 63, 55, and 32 percent in the next 3 years. This sampling allowed no assessment of year-to-year height changes caused by repeated, alternating cycles of growth and browsing; nor did it yield data on mortality or on utilization of current growth.

Accordingly, 20 suckers per clone were tagged in 1976 for measuring each summer and spring. An additional 20 suckers were tagged in each of three exclosures--two on burned clones (Nos. 4 and 9) and one on the unburned (No. 10) clone. Results of subsequent measurements are shown in table 1.

Table 1.--*Effect of browsing on 20 tagged aspen suckers in each of 10 clones*

Clone	Winter 1976-1977			Height change from summer 1976 to summer 1977	
	Mortality	Utilization current growth	Height reduction from summer	Unprotected	Protected in exclosures
	Percent				
1	5	33	28	14	
2	5	46	33	-6	
3	0	38	24	0	
4	20	68	49	-25	16
5	5	58	37	10	
6	5	63	37	-10	
7	5	17	15	10	
8	0	22	13	4	
9	10	64	34	-20	17
10	15	34	10	14	7
Average	7	44	28	1	13

In the winter of 1976-1977, elk browsed an average 44 percent (range: 17 to 68 percent) of the current growth and reduced the average height of suckers 28 percent. In 1977, tagged suckers had grown to an average height only 1 percent greater than before browsing the previous year. Average heights decreased (range: 6 to 25 percent) on four clones, increased (range: 4 to 14 percent) on five, and remained unchanged on one clone. During the same period, the average height of suckers in the exclosures increased 17 percent on the burned clones.

Overwinter mortality of tagged suckers subject to browsing was 7 percent. None of the 60 tagged suckers in the exclosures died.

CONCLUSIONS

So, what have we learned?

- Fire is a temporary deterrent to elk use of aspen stands.

- Although fire increases suckering in aspen, the response among clones is highly variable.

Though analyses are not yet completed, preliminary data plottings suggest that we haven't isolated causes of this variation with accuracy having much predictive value.

The variability does suggest that the probability of successful regeneration of aspen stands used by elk would be enhanced by large fires burning many clones, rather than by small fires in one or two isolated stands. Intuition tells us that badly deteriorated stands of low vigor and few parent stems are poor candidates for burning.

- Whether fire is feasible for regenerating aspen stands under current levels of elk browsing remains to be seen.

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