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on Two Fire Rehabilitations**

*by
James H. Klott
and
Chris Ketchum*



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**BUREAU OF LAND MANAGEMENT
IDAHO STATE OFFICE
3380 Americana Terrace
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by

James H. Klott
Wildlife Biologist
Deep Creek Resource Area
138 South Main
Malad City, Idaho 83252

and

Chris Ketchum
Wildlife Biologist
Burley District Office
200 South Oakley Highway
Route 3, Box 1
Burley, Idaho 83318

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James H. Klott, Deep Creek Resource Area Wildlife Biologist, 138 South Main, Malad City, ID 83252

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Chris Ketchum, Burley District Wildlife Biologist, 200 South Oakley Highway, Route 3 Box 1, Burley, ID 83318

INTRODUCTION

Two fire rehabilitation efforts within the Deep Creek Resource Area have used 'Hobble Creek' sagebrush seedlings as a method to speed the recovery of wildlife habitats following wild fires. The Grandine Fire burned approximately 360 acres on August 8, 1986, part of which was critical mule deer (Odocoileus hemionus) winter range. The Badger Hole Fire burned nearly 3,000 acres during August 9 and 10, 1988. Wildlife values impaired were sage grouse (Centrocercus urophasianus) and sharp-tailed grouse (Tympanuchus phasianellus) nesting and brood rearing habitat and mule deer transition and summer range.

'Hobble Creek' sagebrush is an accession of mountain big sagebrush (Artemisia tridentata ssp vaseyana) (Welch et al. 1986). 'Hobble Creek' sagebrush is preferred by wintering mule deer (Welch et al. 1986), and readily consumed by pygmy rabbits (Brachylagus idahoensis) (White et al. 1982), sage grouse (Welch pers comm. 1990), and domestic sheep (Ovis aries) (Welch et al. 1981 and Welch et al. 1987). 'Hobble Creek' sagebrush contains 11% by dry matter of crude protein during the winter (Welch and McArthur 1979a), which exceeds the winter maintenance requirement for mule deer (Welch and McArthur 1979b, Welch et al. 1986). Welch et al. (1986) provide a detailed description of the soils, elevation, precipitation, and other characteristics of sites where 'Hobble Creek' sagebrush is grown. Jacobson and Welch (1987) describe the methods for planting 'Hobble Creek' sagebrush seed and growing and transplanting containerized seedlings (Welch et al. 1986). This technical note presents the monitoring results on the 'Hobble Creek' sagebrush seedlings at two wild fire rehabilitations. We acknowledge Bruce L. Welch of the Intermountain research Station Shrub Sciences Laboratory for reviewing this manuscript.

STUDY AREA

Precipitation at both Grandine and Badger Hole averages around 12 to 14 inches per year. The majority of the precipitation occurs in the winter and spring as snow or rain. Summer precipitation is sporadic. Elevation at the 'Hobble Creek' planting sites were 5070 feet and 5680 feet at Grandine and Badger Hole, respectively. Soils at the site of the Grandine Fire consist of the Palisade and Hiko Peak Association. Palisade soils are loams, whereas Hiko Peak soils are gravelly loams. Slopes at

the Grandine Fire varied from 10 to <50%, with a generally western aspect. At the exclosures the slope was about 10%. Soils at the Badger Hole Fire are in the Hondo-Ridgecrest-Hades Association. Hondo soils are gravelly silt loams, Ridgecrests are very gravelly loams, whereas Hades soils are silt loams. Slopes and aspects at the Badger Hole Fire were quite variable. However, within the exclosure the aspect was north eastern and the slope varied from 5 to 15%. Grazing by livestock (cattle) was not allowed for two years following the rehabilitation of both fires. In 1989 the Grandine Pasture was grazed by cattle in the fall, but this pasture was rested in 1990. Grandine pasture is grazed in a 3 treatment rest rotation system, grazed in the spring and fall with no grazing during the summer. The Badger Hole area is grazed season long (mid-June to mid-September).

METHODS

The area planted to 'Hobble Creek' sagebrush seedlings was divided into three treatments. First, a control area was designated and was unprotected from either deer or livestock use. A second treatment consisted of a 4 strand barbed wire fence, the top strand at 36 inches, to control livestock grazing, while allowing access to wintering mule deer. The third treatment was a deer proof exclosure, having a 6 inch square mesh fence approximately 6 feet tall, topped with one strand of barbed wire at a height of 7 feet. 'Hobble Creek' sagebrush seedlings were obtained from the Shrub Sciences Laboratory in Provo, Utah part of the U.S. Forest Service Intermountain Research Station. The seedlings were one year old containerized stock that had been grown throughout the winter. Seedlings were planted in April of 1987, by BLM Burley District personnel using methods outlined in Welch et al. (1986).

All of the 'Hobble Creek' sagebrush seedlings were placed into a deer proof exclosure at the Badger Hole Fire. The exclosure fence was 7 foot high composed of 6 inch square mesh. One year old containerized seedlings were obtained from the Shrub Sciences Laboratory. These seedlings were planted by volunteers as part of a Boy Scout eagle project in late April 1989. Two other areas were hand seeded to 'Hobble Creek' sagebrush at Badger Hole on about 4 to 8 inches of snow in the fall of 1988.

Rows in each of the treatments were randomly selected, then all shrubs within a row was measured for the following characteristics. Shrub height was measured using a meter stick from the ground near the stem to the tip of the longest branch. Shrub canopy was measured with a meter stick in two directions. First at the widest and then the narrowest dimensions of the canopy through the center of the shrub. The two measurements were then averaged. Flower stalk length was measured from the tip of the flower stalk to the lowest floret on the stem on the longest flower stalk on each shrub. The number of flowering stems were counted for each shrub sampled. The extensive utilization method was used to evaluate browse use on the sampled shrubs (BLM Manual 4430.C).

Seedling survival was determined using one of two methods. At Grandine, spacing, the presence of a depressions, the presence of dead stems, and the presence of live shrubs were used to determine survival rates. However, at Badger Hole 5 permanent 30 foot radius circular plots were established and the number of sagebrush seedlings within each plot

were recorded. Additionally, mortality due to ants (*Formica* sp.) was evaluated by using 16 foot radius circular plots and measuring the distance from the plot center to each alive or dead seedling at 20 randomly selected ant mounds and 20 plots without ant mounds. Areas hand seeded to 'Hobble Creek' sagebrush were evaluated for seedling establishment with 1/100 acre circular plots.

RESULTS

Survival rates of the 'Hobble Creek' sagebrush seedlings were 88.28% in 1989 and 86.21% in 1990 at the Badger Hole exclosure. While conducting the survivals in 1989, it was noted that the majority of the mortality (65%) occurred within 15 feet of ant mounds in the permanent plots. The number of shrubs with flower stalks increased from 8.59% in 1989 to 44.80% in 1990. Based on the ant plots compared to the control plots it appears that the major cause of mortality at the Badger Hole exclosure was due to defoliation by ants (Table 1).

Hand seeding on snow resulted in an average of 49 seedlings for the plots in 1989. This increased to 69.5 seedlings per plot in 1990.

After four years, the 'Hobble Creek' sagebrush survival study at Grandine indicated that there was a significantly lower survival rate (48.88%) in the area not protected from browsing (control treatment) compared to the livestock and deer exclosures, 79.09% and 78.38%, respectively. Not only was survival impacted by browsing, but shrub height, number of flowering stems per shrub, and shrub canopy size were also influenced (Table 2). Browse utilization showed that cattle consumed nearly 35% of the current annual growth on the 'Hobble Creek' sagebrush in the control area compared to background levels of use in the two exclosures (Table 3). Wintering mule deer increased the level of use on the 'Hobble Creek' sagebrush by an additional 22% in the control and 45% within the livestock exclosure.

DISCUSSION

Data from the hand seeded areas indicates that seeding on 4 to 8 inches of snow is a successful way to establish 'Hobble Creek' sagebrush. Differences between the numbers of seedlings in 1989 and 1990 suggest that due to the small size of some sagebrush seedlings they were not detected or some of the 'Hobble Creek' sagebrush seed remained viable until the second year. Due to the location of the hand seeded areas with respect to unburned sagebrush areas, it is unlikely that the seed came from a local source. The data also suggest that aerial seeding of sagebrush in the late fall is suitable for sites where planting seed to a 5 mm depth (Jacobson and Welch 1987) is not practical.

Based on the utilization data in the fall of 1989 for the control treatment (no exclosure), it appears that cattle forage on 'Hobble Creek' sagebrush. 'Hobble Creek' sagebrush is readily consumed by other forms of livestock, particularly sheep (Welch et al 1986b). Clary (1986) noted both sheep and cattle foraged on black sagebrush (*A. nova*). Richardson et al. (1986) reported cattle readily consumed mountain big sagebrush (accession unknown) seedlings. It is unknown from this study if the season of livestock use, trampling by livestock, the amount of current

annual growth removed during the growing season, or if livestock use coupled with winter browsing by mule deer was the source of the higher mortality in the control treatment. However, research by Wright (1970), Cook and Child (1971) and Clary (1986) indicates that season of use influences mortality in big sagebrush and black sagebrush.

In addition to higher mortality rates, the different levels or season of use appeared to impact the vigor of 'Hobble Creek' sagebrush, particularly canopy diameter and reproductive potential. Hsiao (1986) and Rodriguez and Welch (1989) found similar results were caused by severe defoliation and excessive browsing, respectively. Hsiao reported that sagebrush defoliation caused higher mortality and described the symptoms of reduced vigor as shrubs producing less foliage, a smaller percentage of live branches, and fewer branches producing flower stalks. Results at Grandine, shorter flower stalk length and fewer flowering stems, were similar to those reported by Rodriguez and Welch (1989) and Wagstaff and Welch (1991) on a winter range in Utah. Mortality within the livestock and deer exclosures at Grandine appeared to be principally due to pocket gophers.

At the Badger Hole area, the majority of the mortality appeared to be due to defoliation by ants rather than pocket gophers. Seedlings planted more than 10 feet from ant mounds had a first year mortality rate (5.03%) comparable to plots without ant mounds 4.52%. A first year mortality rate (11.72%) at Badger Hole is slightly higher than other first year mortality rates (Welch pers. comm. 1990). In cases where the planting of seedlings are contracted, a stipulation should be made to plant shrub seedlings at least 10 feet from ant mounds.

Hunter et al. (1980) and Richardson et al. (1986) have recommended that areas planted to shrub seedlings should be protected from livestock grazing for several years. The results at Grandine support their conclusions, but suggest that the type of fencing should reflect the objectives of the plantings. If the objective of the plantation is to produce a seed source to speed revegetation or seed to be scattered in other areas, then a deer fences around plantations should be considered to maximize the amount of seed produced. If the objective is to provide forage for wintering mule deer, then some type of fencing should be considered to control livestock use.

Regardless of the type of fencing around a plantation, 'Hobble Creek' sagebrush seedling establishment in adjacent areas may be slow. McArthur et al. (1988) found that seedling establishment and survival was greatly reduced by excessive browsing mule deer on a winter range in Utah. They concluded that seedlings could not withstand heavy utilization. Rodriguez and Welch (1989) believed that excessive browsing reduced seed production, and therefore, reduced the potential for new seedlings.

Table 1. A comparison of plots centered in ant mounds to plots without ant mounds.

Characteristics	Ant Mounds	Control
n	20	20
X Distance to seedling (feet)	10.72	10.59
X Distance to live seedling (feet)*	12.58	10.54
X Distance to dead seedling (feet)*	6.83	11.48
No. Dead Seedlings*	43	7
No. Live Seedlings*	96	148
Survival rate (%)*	69.06	95.48

* Denotes a statistically significant difference $P < 0.05$

Table 2. Comparison of vegetative characteristics of 'Hobble Creek' sagebrush seedlings in control, livestock exclosure, and deer exclosure treatments.

Characteristic	Control (No Exclosure)	Livestock Exclosure	Deer Exclosure
Shrub height (cm)			
1989*	13.87	25.83	26.27
1990*	23.40	30.70	37.30
Canopy diameter (cm)			
1989*	12.53	23.27	27.38
1990*	21.85	31.06	39.03
Flower stalk length (cm)			
1989*	10.00	23.89	30.33
1990	17.33	17.62	22.42
No. Flower stalks			
1989*	0.30	3.53	14.87
1990*	7.36	20.47	50.57
Flowering Shrubs 1990 (%)*	55.17	83.91	96.5
Survival rate 1990 (%)*	48.88	79.09	78.38

* Denotes a statistically significant difference $P < 0.05$

Table 3. Utilization of 'Hobble Creek' sagebrush by livestock and deer in the Grandine Pasture.

Utilization	Control (No enclosure)	Livestock Enclosure	Deer Enclosure
Fall 1989*	41.66	6.00	4.67
Spring 1990*	64.33	51.67	10.33
Fall 1990	5.28	4.71	5.63

* Denotes a statistically significant difference $P < 0.05$

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Figure 1. "Hobble Creek" sagebrush seedlings (Fall, 1989). All seedlings are the same age. Note the differences in shrub size, seedstalk number, and seedstalk length. Cover board squares are 5 cm. x 5 cm.



Figure 1a. Seedling in the control treatment; no protection from deer or livestock.

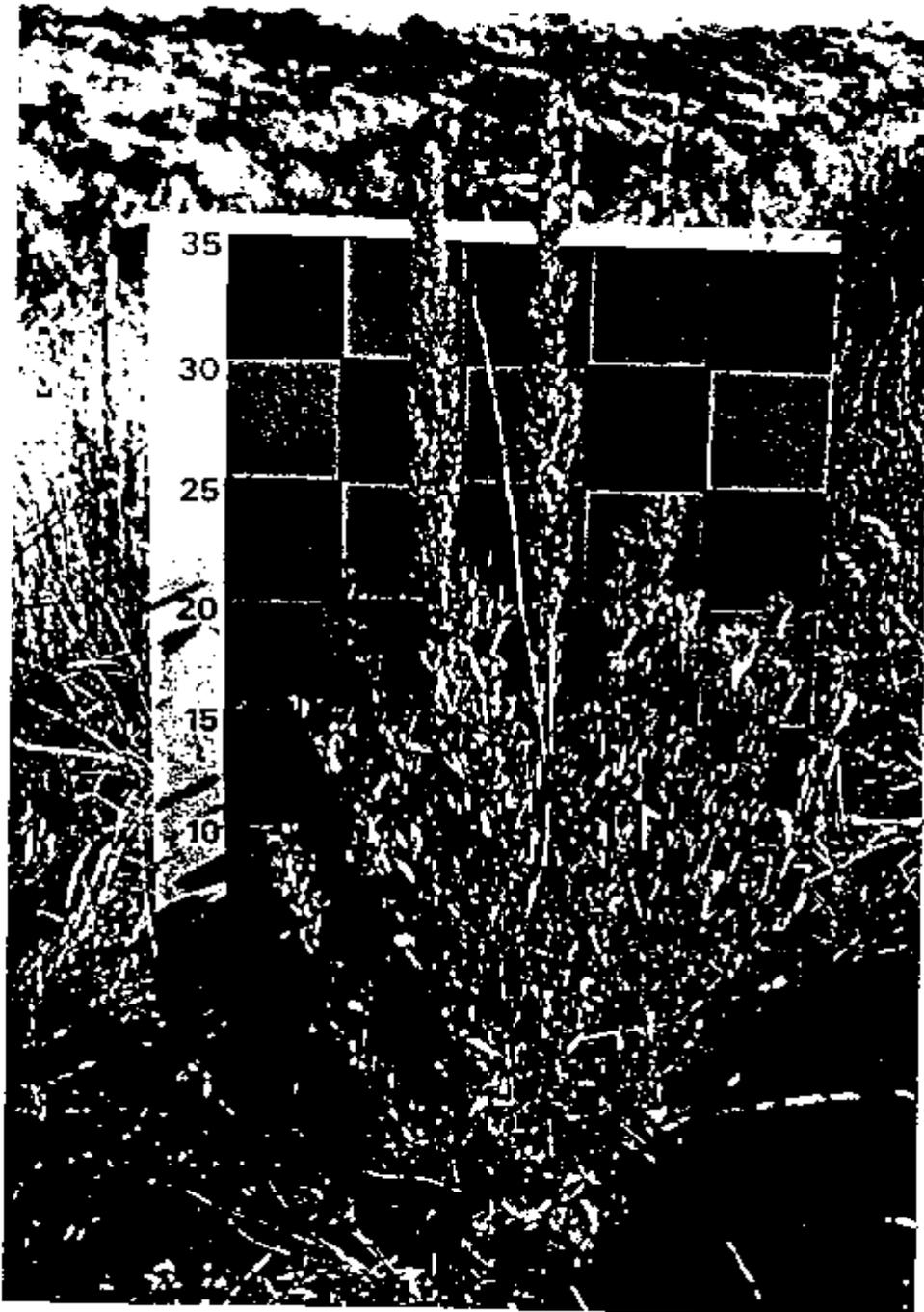


Figure 1b. Seedling in the livestock enclosure.



Figure 1c. Seedling in the deer enclosure.



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