covered with metal roofing. A wooden plug 2 inches thick was fitted underneath the roof section to fill the open upper end of the upright hopper. This greatly increased roof stability. A heavy strap iron hinge connected the roof and the hopper.

The hinged roof (Figure 2B) makes filling the feeders fast and easy, often from the back of a pickup truck. One man can move the feeders, but it is easier for two. Wind-blown rain can damage feed in this device. A larger roof section would prevent this. At first some feed was wasted, but this was easily remedied by nailing a 2x6 lip along the top of the feeder opening so that a 2 inch rim extended over the inside edge of the two troughs.

After 2 years of use and a number of moves between and within units to improve grazing distribution, the Whirlwind and homemade drum feeders have done a good job.

PELLET SEEDING ON SAGEBRUSH RANGE

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To determine the effects of pellet seeding as a means of improving the foothill ranges of the Intermountain Region, a a study was conducted from September, 1949 to March, 1951 on a sagebrush-grass range near Logan, Utah. Observations were made on seedling emergence and survival from 49 types of plastic-coated wheatgrass (*Agropyron cristatum* L.) pellets and bare seeds. Pellets were drilled and broadcast on untreated, plowed and burned areas in the fall of 1949 and the spring of 1950. The experiment involved a randomized split-plot design. Subsequent greenhouse and laboratory tests were conducted to better evaluate the results of this study.

The majority of seedlings from fall plantings emerged early the following spring. The total emergence from fall planting was approximately one-half that from spring planting. The number of seedlings which emerged from pellets and seeds drilled into the soil was about 8 times that from surface planting. The burned area gave approximately 3 times greater emergence than the plowed area and 7 times greater emergence than the untreated strip. An analysis of seedling emergence from 49 types of plastic pellets indicated that 10 types gave significantly lower emergence than bare seeds, and only 1 gave higher emergence. Seedling emergence from all other pellets did not vary significantly from that of bare seeds.

Seedling survival, generally low under all treatments, was not consistently related to emergence, but varied among seasons of planting, methods of land treatment and type of pellets used. Seedling survival from fall planting was over 300 times greater than from spring planting. The number of seedlings which survived from drilled pellets and seeds was nearly 130 times greater than from surface planting. Survival of seedlings on the plowed area was over 300 times greater than on the burned and untreated strips, no significant difference occurring between the latter treatments. Counts from 49 types of chemical pellets showed that 9 types gave markedly better survival than bare seeds when drilled into the soil. Seedling survival from all other pellets was not significantly higher than from bare seeds.

From this study, it was concluded that seeding sagebrush foothill ranges of the Intermountain Region with plastic-coated pellets is not warranted. Pelleting does not provide adequate protection for seeds planted on the surface of the ground to permit an increase in germination, seedling survival and growth. Under greenhouse conditions, bare seeds evidenced materially higher germination than any of the 49 types of plastic pellets. Apparently, the pellet coating effects a marked reduction in viability of seed during storage. Although 9 types of pellets gave significantly higher survival than bare seeds when drilled into the soil, low survival under all treatments rendered any conclusions regarding ultimate grass establishment questionable. Moreover, no significant differences occurred among plastic-covered pellets and bare seeds placed on the surface of the ground, the situation under which pellets would normally be used.

SMALL VELVET MESQUITE SEEDLINGS SURVIVE BURNING

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Planned burning to reduce the number of shrubs and increase grass production has been used successfully in various parts of the western range area and with various shrub species (Blaisdell, 1953; Love and Jones, 1952; Sampson, 1955). Fire may completely kill essentially all plants of nonsprouting shrub species. With sprouting species fire may kill some plants completely but only top-kill many others, which then sprout from the stem base or from the roots.

Such use of fire to control woody plants in the Southwest is largely in the experimental stage (Reynolds, 1959). The possibility of controlling invasion

[1] *Central headquarters maintained in cooperation with Colorado State University, Fort Collins, Colorado. Research reported was conducted in cooperation with the University of Arizona, Tucson, Arizona.*

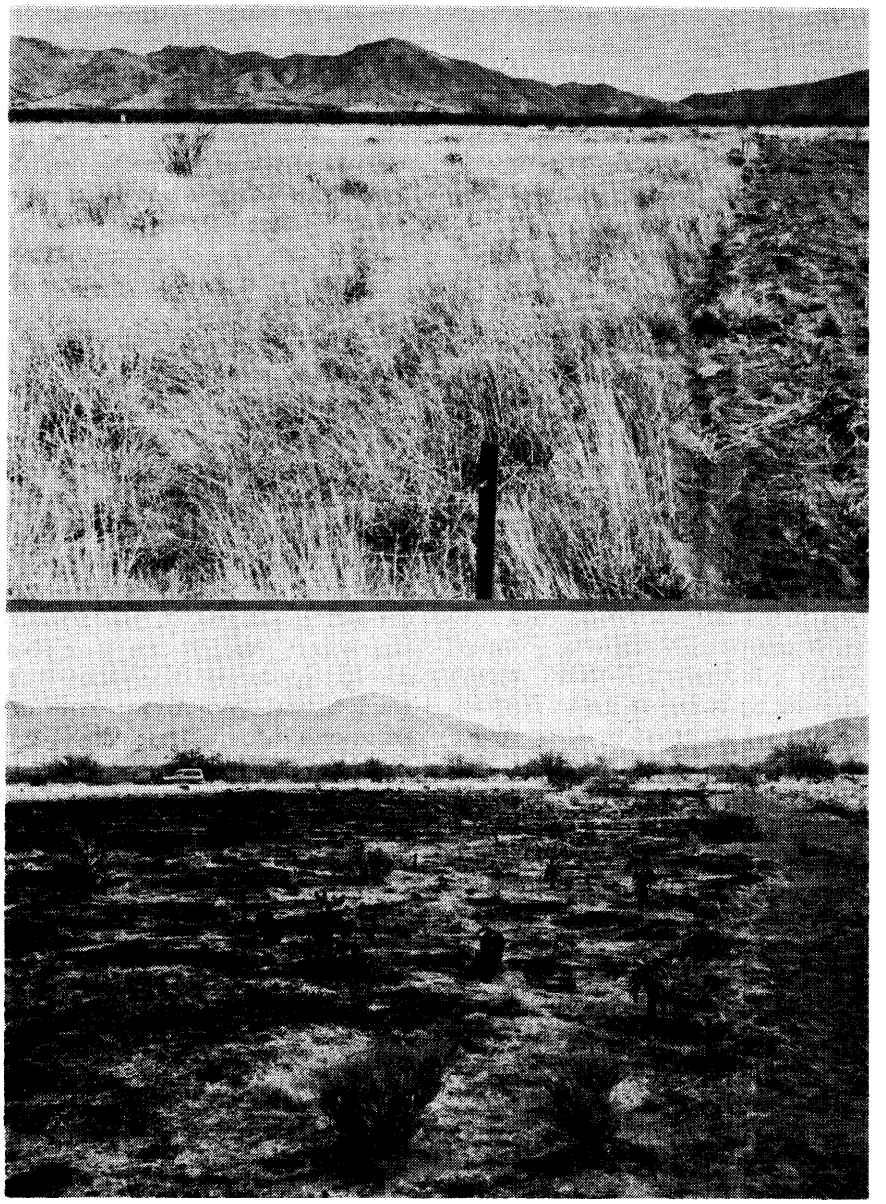

FIGURE 1. General views of study area, Top: before burning, and Bottom: after burning.

stands of velvet mesquite *(Prosopis juliflora* var. *velutina),* a vigorous sprouter, by burning has been the subject of sporadic research in the Southwest. Glendening and Paulsen (1955) found that 60 percent of plants a half inch or less in stem diameter were killed by burning in June. Reynolds and Bohning (1956) found that only 9 percent of the mesquite trees on a 100-acre area, also burned in June, were killed and that all of these were less than 6 inches in stem diameter. All trees with less than 2 inches basal diameter were affected by the burning, but 60 percent of them sprouted.

A study was made on the Santa Rita Experimental Range near Tucson, Arizona, beginning in 1955, to learn more about the susceptibility of very young mesquite to fire. In this study young mesquite plants growing in a dense grass cover were burned when the plants were at 2 ages: in March when 8 months old, and in June when 12 months months old. The mesquite plants were transplanted into the grass stand as 3- to 4-week old seedlings. The burning treatments were applied by broadcast burning the good stand of annual and perennial grasses. The fuel provided by these grasses was sufficient to produce a clean burn (Figure 1).

Of the 34 live plants burned at 8 months of age, 23 were completely killed. The other 11 were top-killed and sprouted later from the base. Of 26 live plants burned at 12 months of age, 17 were completely killed; the other 9 were top-killed only and sprouted later. In both cases, the plants that were only top-killed were well distributed over the burned area.

Thus, burning killed about two-thirds of the mesquite plants, which were 4 to 6 inches tall and up to 1 year old. The other third were top-killed, but sprouted from the base. This ability of very young and very small velvet mesquite to sprout from the base when top-killed makes eradication by burning difficult if not impossible, although repeated fires might preserve a shrub-free appearance by repeatedly top-killing the mesquite plants.

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