

FREQUENT MOWING INCREASES TURKEY MULLEIN ON CALIFORNIA FOOTHILL RANGELAND

Turkey mullein (*Eremocarpus setigerus*) seed is an important food for dove and quail. Yet information about its management is singularly scarce. A major food of dove (Browning 1962), turkey mullein is often eaten by quail (Emlen and Glading 1945; Glading et al. 1940; Jepson 1923). Shields and Duncan (1966) and Duncan and Shields (1966) found that the plant was somewhat less important in the fall-winter diet of quail in studies made during a series of rather dry years. In a study of quail food in a wet year, Duncan (1968) found that it ranked second only to legume seeds in the diet.

In 1965, a range study was started at the San Joaquin Experimental Range near Coarsegold, California to determine the effects of different mowing rates on forage plant composition. The purpose of mowing was to simulate livestock grazing. As a byproduct of the research, data was collected that should help game managers, ranchers and others to obtain a better supply of preferred game bird food, and attract more birds, by increased growth of turkey mullein plants. A dramatic response in the growth of turkey mullein to frequent mowing was found.

STUDY AREA AND METHODS

The Experimental Range, in the Sierra Nevada foothills, is maintained by the Pacific Southwest Forest and Range Experiment Station. On that range turkey mullein is considered one of the few "summer" annuals that reaches full growth after most of the other, earlier-maturing annual plants have completed their growth. Its general abundance in any year seems closely related to available soil moisture. Most of the growth of turkey mullein occurs after the rainy season. In general, turkey mullein on the Experimental Range is more common in the swales, where the soil (Visalia series) is deeper and holds more moisture. The data reported in this paper are not from a swale site, but from plots on a gentle slope, where the soil is Ahwahnee coarse sandy loam, mostly 50.8-91.4 cm (20-36 inches) deep.

Two blocks were set up each consisting of four 24.4 by 6.1 m (80-by-20 ft) plots. Within each plot were 1.2 m (4-ft) buffer strips on two sides. The rest of the plot was divided into four .91 m (3-ft) sampling strips that were randomly designated A, B, C, and D. The buffer strips were labeled E.

The study consisted of two replications (blocks 1 and 2) of four treatments: (i) mowing every 2 weeks during main growing season (roughly January or February through April or May); (ii) mowing every 3 weeks; (iii) mowing every 4 weeks; and (iv) no mowing (approximates grazing during dry-forage season or no grazing). Mowing was done with a heavy-duty rotary mower, which left a stubble height of about 3.8 cm (1½ inches).

At the end of the growing season, each treated strip was sampled and the rest of the herbage harvested. Litter in excess of 362.9 to 453.7

kg (800 to 1,000 lb) to affect turkey mullein after treatments were made.

In 1965, the A strip sampling strips were mowed. In 1966, the strips were left unmowed.

In the first year of the study, the growing season was average but more so. After all the other mullein plants began to

The abundance of turkey mullein was not intended to reach maturity, but the next year. The solid mat of turkey mullein was counted.

1966 was a dry year. The average height was 32.5 cm (12.81 inch). Conditions were un- favorable. They were not counted.

By pulling out a seed source been established. Responsible for an annual seed still in the soil.

It was a long winter. Of the 71.1 cm (28 inch) height on March 1, and 22.8 cm (9 inch) on March 15. For the first time, the height was earlier than turkey mullein and grew longer than bumper crop of turkey mullein.

On September 7, the height was (1 inch) high were counted. Our lack of time, the height was not counted.

The year 1968 plots in fall totaled only 30.5 cm (12.01 inch) (0.46 inch). Again in the plots.

There was a close relationship between the number of turkey mullein plants and the number of plots mowed every 3 weeks. Four plots mowed every 3 weeks, four times as many as not a sample.

kg (800 to 1,000 lb) per acre was removed. None of the activities seemed to affect turkey mullein. The plants made practically all of their growth after treatments were completed.

In 1965, the A strips in each plot were left unmowed; the remaining sampling strips were mowed at designated intervals, according to treatment. In 1966, the B strips were unmowed; in 1967, the C strips were left unmowed.

In the first year of the study, 49.9 cm (19.65 inches) of rain fell during the growing season. This amount was only slightly higher than average but more than 12.7 cm (5 inches) fell in March and April. After all the other plants had matured and been sampled turkey mullein plants began to grow.

The abundance of these plants posed a definite problem because it was not intended to study them originally. If they had been allowed to reach maturity, sampling of the plots would have been very difficult the next year. The mowed portions of the area would have been almost a solid mat of turkey mullein plants. So all the plants were pulled and counted.

1966 was a dry year—rainfall in the growing season totaled only 32.5 cm (12.81 inches), 3.4 cm (1.32 inches) of it falling after March 1. Conditions were unfavorable so turkey mullein plants were scarce, and they were not counted. Areas outside the test plots showed a similar condition.

By pulling out all the plants before they matured in 1965, had the seed source been eliminated? Or were the dry conditions in 1966 responsible for an almost complete lack of turkey mullein with viable seed still in the soil? How long would the seed remain viable?

It was a long wait for some of the answers; 1967 was a wet year. Of the 71.1 cm (28 inches) during the growing season, half fell after March 1, and 22.8 cm (9 inches) in April was a record for that month. For the first time in many years, annual-herbage species that develop earlier than turkey mullein matured in a soil with abundant moisture, and grew longer than usual. All of these developments produced a bumper crop of turkey mullein.

On September 7, 1967, all turkey mullein plants more than 2.5 cm (1 inch) high were pulled and tallied. Because of the many plants and our lack of time, the plants on only one block were counted.

The year 1968 proved to be similar to 1966 for turkey mullein. Rainfall totaled only 30.3 cm (11.93 inches); that for April was only 1.2 cm (0.46 inch). Again, no counts were made because of the few plants in the plots.

RESULTS AND DISCUSSION

There was a close relationship between intensity of mowing and the number of turkey mullein plants counted on August 9, 1965 (Table 1). Plots mowed every 2 weeks during the growing season of plants which mature earlier had twice as many turkey mullein plants as those mowed every 3 weeks, four times as many as those mowed every 4 weeks, and 20 times as many as the unmowed plots. All data are total plant counts, not a sample.

TABLE 1. Number of *Eremocarpus setigerus* Plants After Three Intensities of Mowing During the Growing Season of Other Species, San Joaquin Experimental Range, 1965 and 1967

Treatment no.	Frequency of mowing	No. of plants		No. of plants per .099m ²	
		*1965	†1967	*1965	†1967
1.....	Every 2 weeks	1,364	4,061	0.43	2.54
2.....	Every 3 weeks	777	2,657	0.24	1.66
3.....	Every 4 weeks	375	2,076	0.12	1.30
4.....	None	57	459	0.02	0.29

* Two replications counted in August.
† One replication counted in September.

When the mowing frequency was every 2 weeks, the number of plants in 1965 was 1,364; that in the unmowed plots was 57 (Table 1). The results in 1967 were equally startling: 4,061 in the plot mowed every two weeks; 459 in the unmowed plot. Outside the study area many turkey mullein plants germinated, but relatively few grew in the dense stand of other earlier-maturing annuals.

MANAGEMENT IMPLICATIONS

Ranchers and range and game managers have long noted that more turkey mullein will grow when grazing has been heavy or the soil has been disturbed. This study showed a marked response by the plant to mowing treatments. Frequent mowing resulted in many times more turkey mullein plants than less frequent mowing or no mowing.

From the manager's viewpoint, the implications are clear. If a site is suited to growth of turkey mullein and the seed is there, the manager may be able to increase the number of plants by mowing or by grazing practices.

Results of this study point to the effects of weather. There was an almost complete absence of turkey mullein in 1966 and in 1968—both dry years. In contrast, abundant stands grew in 1965 and 1967—both wet years.

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The nest was central depress nica) and black reticulata and fir (*Psuedotsu needles, twigs, nest lining eve mile) of the ne*

TABLE 1. Prey R 1974

Deer (small fawns).....
<i>Odocoileus hemionu</i>
Grey squirrels.....
<i>Sciurus griseus</i>
Jack rabbits.....
<i>Lepus californicus</i>
Domestic sheep (sma
<i>Ovis aries</i>
Ground squirrels.....
<i>Citellus beecheyi</i>
Crows.....
<i>Corvus brachyrhyn</i>
Brush rabbit.....
<i>Sylvilagus bachman</i>
Unidentified bone fra
Totals.....

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