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# ROSE CLOVER

A NEW WINTER LEGUME

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CALIFORNIA AGRICULTURAL  
Experiment Station  
Extension Service

CIRCULAR 407



## ROSE CLOVER . . .

is an annual winter legume recently introduced and tested throughout California. It will grow and thrive on soils that will not support good growth of bur clover or subclover. Seed is available commercially.

### **One seeding . . .**

in the fall establishes the crop. On soils of low fertility, the first-year stand of rose clover may be sparse, and the growth poor, but invariably it increases in density and production. It reseeds and volunteers year after year.

### **As a soil builder . . .**

it is excellent. It prepares the way for other legumes and grasses.

## PLANT ROSE CLOVER

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**The cover picture** shows a mature plant of rose clover at approximately one third the height it reaches when full grown in good soil. At the lower left is a seed pod (calyx) of rose clover, approximately 4 times actual size. (All drawings by Mrs. Gertrude Julian.)

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# ROSE CLOVER

## *A New Winter Legume*

R. MERTON LOVE and DORMAN C. SUMNER

IN 1949, after five years of range plot trials in 15 counties, seed of rose clover was made available commercially in California. Since then, this legume has become as well known as many of the old, standard forage crops, such as bur clover and filaree.

### **Rose Clover Is Adaptable . . .**

It will grow in soils where practically no other plants survive, and will even provide some forage under such unfavorable conditions.

In Central Europe, rose clover is described as growing "in dry, sterile fields, on slopes, on sandy steppes, on roadsides, in waste places in the Mediterranean region. . . ." It has been observed in the area north of the Mediterranean from southwestern to southeastern France, across to Trieste, in Serbia, and elsewhere in Europe and Asia Minor.

In California, so far as the writers know, rose clover has been successful on all acreage seedings, and such seedings have been made in almost every zone of the state. (See table 1, p. 4.)

### **Livestock Like It . . .**

Cattle, sheep, and deer appear to graze rose clover well even when it is completely dried up. It is also well liked by doves and quail.

No palatability studies have been conducted, but observations throughout the state show that sheep and cattle graze rose clover as readily as they do other annual clovers. A significant observation in Santa Clara County is worthy of mention. A series of plots had been seeded side by side. After three years, rose clover had

invaded the subclover plots. The rose clover-subclover area was grazed much more closely by cattle than was the subclover area. According to the Farm Advisor, after rose clover had been growing for two years in a 1½-acre field, grasses appeared again. When horses were turned into the field, they avoided the grasses and grazed the rose clover first. Close grazing does not seem to force rose clover back.

Little is known about the nutritive value of rose clover, but it appears to be comparable with that of other legumes. Protein content of rose clover is slightly less than that of bur clover at similar stages. Rose clover samples had a protein content of 24.9 per cent when lush and green, compared with 27.0 per cent for bur clover. At the flowering stage, 12.6 per cent protein in rose clover may be compared with 15.0 per cent for bur clover. Dead, dry rose clover plants have 8.0 per cent protein, and those of bur clover, 13.9 per cent. (The figures for bur clover are averages obtained from Professor Harold Goss, Division of Animal Husbandry, and are not directly comparable with those for rose clover, but will serve as a general comparison.)

Samples cut in May, from a mixed planting in a phosphated field in Sacramento County, showed the following protein contents: rose clover, 12.6 per cent; crimson clover, 16.7 per cent; and subclover, 17.3 per cent.

### **Trial Plots Proved Its Worth . . .**

In 1944, the Division of Agronomy received small amounts of seed of annual legumes from the United States Depart-



Fig. 1—A very small plant of rose clover, about 2 inches high, that developed in an unfavorable location in the Blue Mountain burn, Shasta County. Compare with Figure 2. (Seeded fall, 1950; photographed August, 1951.)

ment of Agriculture at Beltsville, Maryland. Among these was a packet of rose clover seed. This sample came from Turkey, and was given the U.S.D.A. accession number F.C. 23,104. In California, its range trial key number is 102.

The first trial plantings were made in the fall of 1944, in cooperation with the Agricultural Extension Service. These consisted of 25 range plots in 15 counties. Reports received by the Division of Agronomy in 1945 are shown in Table 1.

**Rose clover reseeds itself.** A high percentage of each year's crop of seed is hard. Therefore, not all seeds will germinate when the first fall rains come, and some may remain in the ground for a year before germination takes place. Rose clover has the ability to produce some seed under extremely unfavorable conditions (fig. 1). This reseeding ability is important, as shown by the fact that some of the test plots rated "poor" in the 1944 trials were rated "excellent" by 1946. This may have been partly because the hard seed from previous years began to grow. The "excellent" rating in these plots was maintained through the four severe winters 1946-1949, and rose clover plants were also showing up in other parts of the fields, beyond the test plots. Percentage of hard seed in nine samples of rose clover is shown in Table 2.

**Table 1. Performance Rating of Rose Clover in 15 California Counties, 1945**

Zone*	County	Number of plots	Performance	Rank †
1	Mendocino . . . . .	2	Good, Fair	1st
	Trinity . . . . .	1	Fair	1st
	Lake . . . . .	1	Fair	1st
2	Santa Clara . . . . .	1	Fair	2nd
	Santa Cruz . . . . .	1	Fair	2nd
	Monterey . . . . .	1	Poor	3d
3	San Diego . . . . .	5	Good (4), Fair (1)	1st (1), 2d (3), 3d (1)
4	Amador . . . . .	2	Good, Poor	1st (1), 2d (1)
	Calaveras . . . . .	2	Good, Poor	1st (1), 3d (1)
	Nevada . . . . .	2	Good, Fair	1st
	Butte . . . . .	2	Good, Fair	2d
	Sacramento . . . . .	1	Good	1st
5	Mariposa . . . . .	2	Good	1st
6	Sierra . . . . .	1	Fair	1st
	Plumas . . . . .	1	Good	1st

\* See map, page 6, for planting zones.  
 † In comparison with bur clover and subclover.

**Table 2. Hard Seed Content in 9 Samples of Certified Rose Clover Seed**

Year	Germination	Hard seed	Total viable seed
	per cent	per cent	per cent
1949.....	67.50	20.75	88.25
	49.50	36.50	86.00
1950.....	69.50	24.75	94.25
	64.00	30.25	94.25
	60.75	32.50	93.25
	44.00	48.00	92.00
	44.50	48.50	93.00
	48.00	33.50	81.50
	61.50	35.00	96.50

**Certified seed is available.** On the basis of the trial performances, the California Crop Improvement Association certified the seed increase of rose clover. A 50-pound lot of F.C. 23,115 (the progeny of F.C. 23,014) was obtained from the U.S.D.A. in November, 1947, and used as foundation seed. The first certified increase field of rose clover in the state was planted in Madera County in February, 1949. Sixteen acres were seeded, and produced 420 pounds of certified seed per acre. The grower increased his planting to 71 acres the following year, and produced 316 pounds per acre. Thus, in 1950, more than 11 tons of pure seed were available to ranchers, and by 1951, about 33 tons. (There are approximately 177,000 seeds in a pound of rose clover, as compared with 220,000 for alfalfa, and 140,000 for subclover.)

How much of this certified seed was planted is not definitely known, but acreage seedings were made in a number of counties. In Shasta County, a seeding of 4,400 acres on a control burn in 1950 included rose clover in the seed mixture (fig. 2). In Butte County, another seeding on a control burn of 1,000 acres also had rose clover in the mixture. Both were very successful. Other acreage seedings were made in almost every zone in the state.

In so far as the writers know, rose

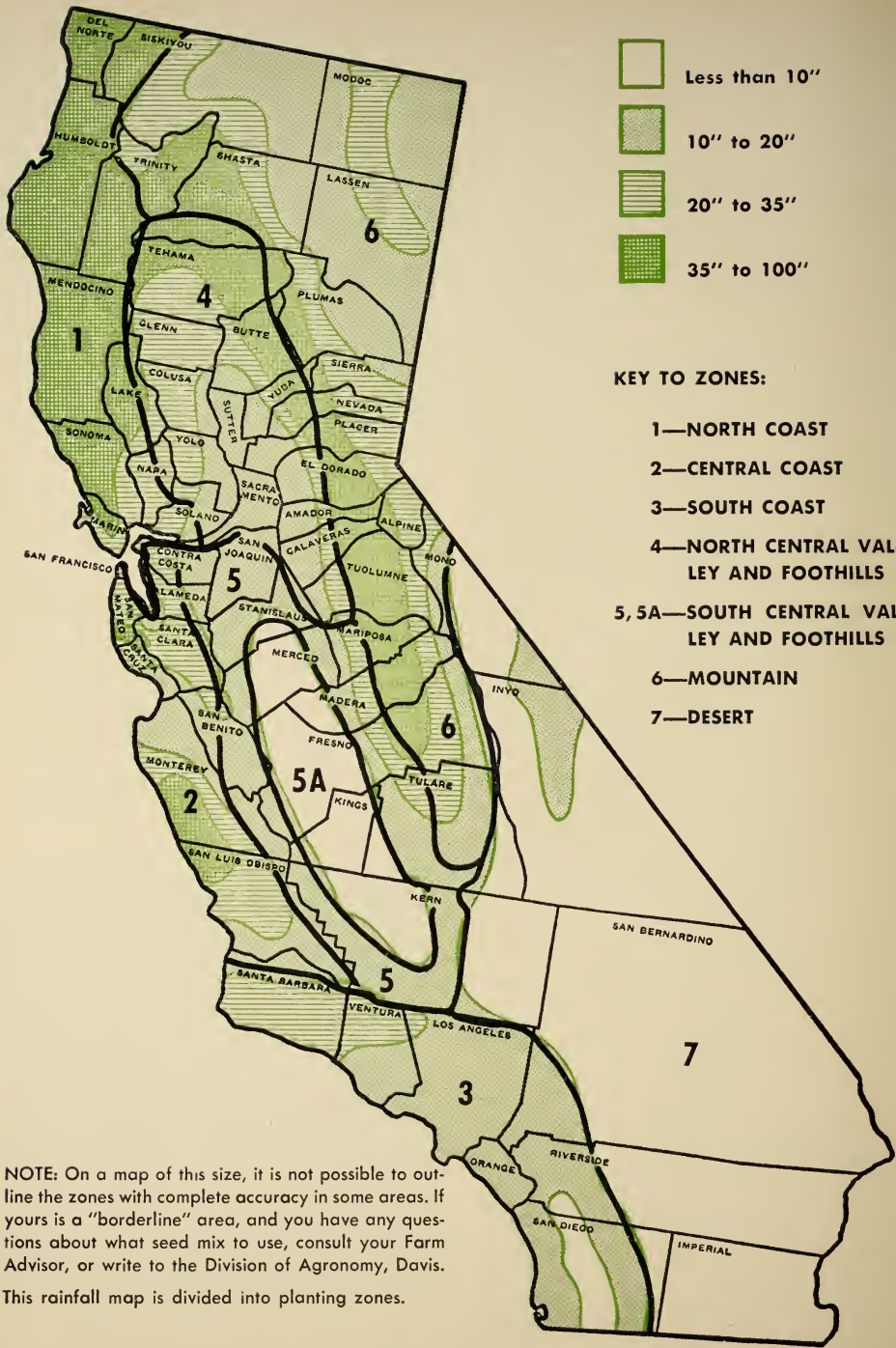
clover has not failed wherever it has been planted in acreage seedings. During the trial period there were two failures, both in small plot trial seedings. In Monterey County, near San Lucas, no stand was obtained the first year, and in Tehama County, near Corning, a good first-year stand did not volunteer the second year. Reasons for these failures are not known.

### What Rose Clover Looks Like

The scientific name for rose clover is *Trifolium hirtum* All. It is a many-



Fig. 2—Rose clover responds to favorable conditions by putting on more growth. This plant is in the same area as that shown in Figure 1, but on a different site. (Photographed August, 1951.)



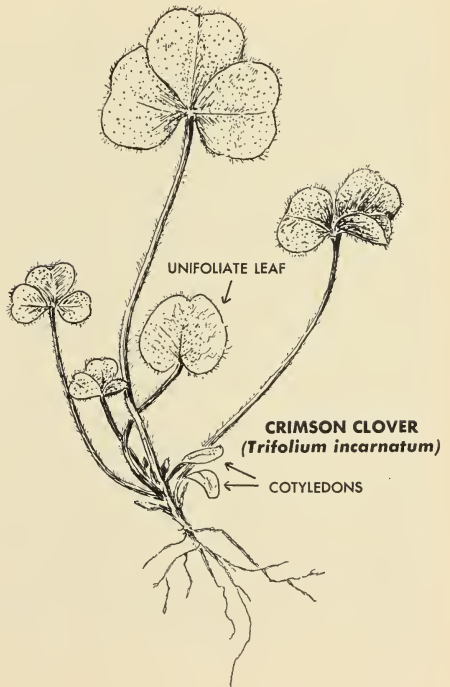
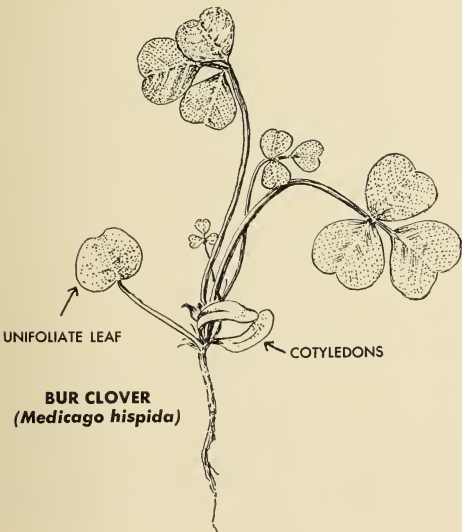
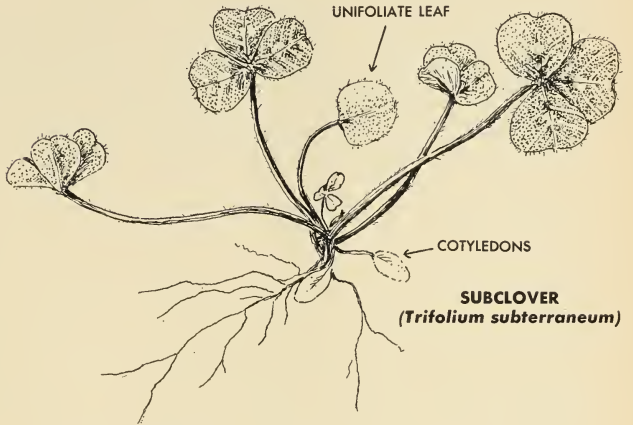
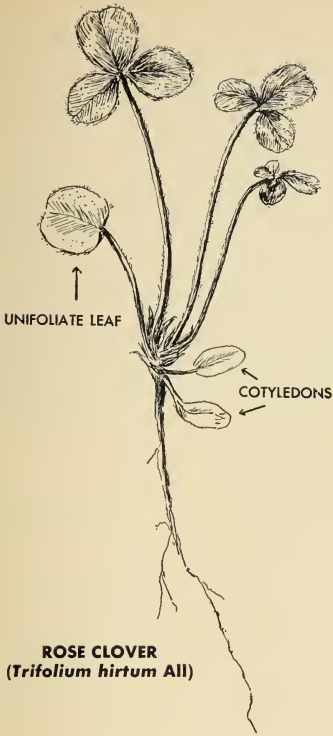
**KEY TO ZONES:**

- 1—NORTH COAST
- 2—CENTRAL COAST
- 3—SOUTH COAST
- 4—NORTH CENTRAL VALLEY AND FOOTHILLS
- 5, 5A—SOUTH CENTRAL VALLEY AND FOOTHILLS
- 6—MOUNTAIN
- 7—DESERT

NOTE: On a map of this size, it is not possible to outline the zones with complete accuracy in some areas. If yours is a "borderline" area, and you have any questions about what seed mix to use, consult your Farm Advisor, or write to the Division of Agronomy, Davis. This rainfall map is divided into planting zones.

# CLOVER SEEDLINGS

Fig. 3—The drawings on this page will aid ranchers and others in identifying the young plants of the annual clovers most commonly used in range seedings.



branched, winter annual legume that grows from 3 to 18 inches high (fig. 2). The spreading branches are densely covered with short, coarse hairs. As with most true clovers, each leaf has three leaflets at equal distances from the end of the leaf stalk, the center one somewhat larger than the other two. These leaflets are about the size and shape of those on bur clover, have a scattering of short hairs over both surfaces, and usually a small, reddish mark a little above the center. The leaf stalks are from  $\frac{1}{2}$  to 2 inches long, and have hairs like those on the leaflets. At the base of the leaf stalks are hairy stipules  $\frac{1}{4}$  to  $\frac{1}{2}$  inch long, with smooth margins and long, tapering points. The flower heads are rose-colored, spherical, about  $\frac{3}{4}$  inch across, and profusely covered with stiff, white hairs. A leaf with somewhat smaller leaflets grows directly from the base of the flower head, and the stipule of this leaf cups up around the base of the head in a manner similar to that of red clover. The seed is yellow-

ish, smooth, a little over  $\frac{1}{16}$  inch long, with a scar on the end. Very faint lines on the seed, that meet at the scar end, can be seen with a hand lens.

### **Plant Rose Clover On Annual Type Ranges . . .**

**Seedbed preparation.** Treat the seed with a general *Trifolium* (true clover) inoculant just before planting. Plant in the fall for best results (fig. 4). A minimum of seedbed preparation is required. Apply 100 to 300 pounds of single superphosphate per acre; disk the field before the fall rains. After seeding, roll the area with a ringroller or cultipacker.

If you follow these directions, you will have good results: (1) the seedbed will be firm; (2) seed will be covered with a light mulch of soil and organic matter; (3) young plants will have a ready source of phosphate, necessary for maximum growth; (4) nitrogen-fixing bacteria will be present for nodulation of the roots.



Fig. 4—Rose clover was seeded in early October, 1950, at 2 pounds per acre. Single superphosphate was applied at 200 pounds per acre, following a dry disking. A good stand developed. Area is near Wheatland, Placer County. (Photographed May 21, 1951.)





Fig. 5—Left, freshly disked area with abundance of tarweed. Right, six-year-old stand of rose clover has practically eliminated undesirable annuals. Desirable annuals, such as soft chess and even annual ryegrass, are invading the area, which is near Wilton, Sacramento County. (Photographed October 13, 1951.)

**Seeding.** Use from 1 to 10 pounds of seed per acre. Drill or broadcast the seed. If you are not in a hurry, use the lower seeding rate. An original seeding of 1 pound per acre will generally develop into a solid stand in four or five years. The higher rate should provide a solid stand the second year.

If the soil is extremely infertile and supporting practically no growth of native plants, use rose clover alone. If there is a fairly good cover of native weedy annual grasses and other types, use a mixture of 50 per cent rose clover, 25 per cent subclover, and 25 per cent crimson clover. (Bur clover is not recommended in this original mixture because if it is not already present on a range, it is probably not adapted to the soil conditions existing in that particular annual type range.)

A mixture of winter annual legumes is desirable for two reasons: (1) Seasons vary tremendously in California, and rose clover may do better one year, and subclover another, on the same site. (2) Any field has some soil variation, and rose clover will occupy the poorer soil or better drained areas, while subclover will do well on the better soil or moister sections.

**Seasonal use.** Graze the area as soon as the weeds and annual grasses are of pasturable height. By that time the cotyledons (seedling leaves) of rose clover will have dropped off, and true leaflets will have formed. The plants will be 2 to 5 inches high. Take care to prevent trampling damage if the soil is too wet.

Grazing may be delayed until late March, after more growth has developed, but if this is done, the field should be grazed heavily for about a month. Recent experience in Placer County showed that 150 Hereford cows and their calves were required to graze satisfactorily a new 50-acre planting in 30 days. That is three animals to the acre for a month.

Whether the field is grazed throughout the winter, or heavily for a shorter period in the spring, three things should be kept in mind: (1) The first objective should be to graze the weeds, both grasses and nongrasses, as closely as possible. (2) Stock should be removed from the field before the last spring rains, to allow the clover plants to recover and set a good seed crop. (3) The more moisture used by the rose clover plants as they mature, the less there will be available for the undesirable summer annuals, such as star thistle and tarweed (fig. 5).

Do not be concerned if the field looks very weedy the first year. This is the result of the initial cultivation, which encourages weed seed germination. The field will take on a cleaner appearance each succeeding year if livestock use is handled as recommended.

### **On Brush Burns . . .**

Include rose clover in the seeding mixture. It grows in the shade of tall grasses (fig. 6). No other range legume has proved to be so well adapted to such a great variety of soil types and climatic conditions.

Use  $\frac{1}{2}$  to 1 pound of seed per acre. This is usually adequate when included in a general seed mix, such as harding, smilo, burnet, and alfalfa. Inoculate the seed with a general *Trifolium* inoculant just before mixing with other seeds.

Rose clover will respond favorably to the same grazing treatment as that recommended for established perennials and desirable annuals on a burned area. (See Experiment Station Circular 371, "Improving California Brush Ranges," for detailed recommendations.)

### **On Grain Land . . .**

The only evidence on this use of rose clover is a 50-acre planting near Farmington, San Joaquin County. The seed was planted December 1, 1950, in red oat stubble. No seedbed preparation was made because of wet weather. Single superphosphate was applied at the rate of 500 pounds per acre. Inoculated seed was broadcast by airplane, at the rate of 8 pounds per acre. The rose clover, which was harvested with the oats, yielded 119 pounds of seed per acre.



Fig. 6—Rose clover has performed better than any other range legume in brush burn seedings. Note the dense stand of mature rose clover in the tall harding grasses. Area is near Rescue, El Dorado County. (Seeded by plane October, 1950; photographed July, 1951.)



Fig. 7—Very poor first-year growth of rose clover and other legumes seeded by 2-row range seeder on ranch in eastern Glenn County. Poor growth is common on infertile land. (Seeded November 1, 1949; photographed March 27, 1950.)

If you wish to plant rose clover with a cereal, use 1 to 10 pounds of rose clover seed per acre. There are two methods for planting: (1) seed the cereal first, then seed the rose clover by airplane; or (2) have an alfalfa drill attached to the grain drill and seed the cereal and clover at the same time.

The advantages of growing rose clover on grain land are: (1) It will do well on soil types that do not support a good growth of bur clover. (2) It will provide a good aftermath feed to supplement the cereal stubble. (3) It will volunteer in succeeding years and add nitrogen to the soil, thus aiding the grain crop.

### **On Abandoned Grain Land . . .**

Give rose clover the same treatment as that described for annual type ranges. Trials and experience generally throughout the state indicate that, to date, rose



Fig. 8—Same field as that shown in Figure 7. Of the mixture seeded, rose clover was the only one showing a marked improvement in stand and growth the second year after seeding, as a result of volunteering. (Photographed May 21, 1951.)

clover is the best winter annual legume to use to reclaim such land.

Gradually it builds up the soil to the point where it will support more and more growth of desirable forage plants. A striking example is a ranch in Santa Clara County where the soil had become very thin, and would not support vegetation. The soil was improved through use of rose clover, which built up the depleted nitrogen supply.

In Glenn County, 10 species were seeded in the fall of 1949, including four legumes (rose clover, Mt. Barker and Tallarook subclovers, and alfalfa), five grasses (harding, smilo, tall fescue, prairie brome, and tall oatgrass), and burnet. There was a fair stand, but poor growth, of most species the first year (fig. 7). The second year there were a few plants of subclover. But rose clover dominated the picture (fig. 8).

### **ACKNOWLEDGMENTS**

The authors wish to thank Mr. Robert Tofsrud, Division of Agronomy, for the botanical description of rose clover and for the specimen from which the botanical drawing was made, and Mr. James Street, Division of Agronomy, for supplying some of the pictures used in this circular.

# 6

## STEPS TOWARD RANGE IMPROVEMENT

- 1** *Seed rose clover or a mixture of annual legumes before the fall rains begin.*
- 2** *At the time of seeding, apply superphosphate or soil amendments that encourage legume growth.*
- 3** *Graze one subdivision of the range heavily before the annual grasses head out in the spring.*
- 4** *Keep stock off the grazed subdivision until fall.*
- 5** *Apply steps 3 and 4 to a new field each year.*
- 6** *Plan a good pest-control program, with special attention to gophers. Your local Farm Advisor or Agricultural Commissioner can recommend the best methods of control.*

**While any grazing-management plan must be based on individual ranch conditions, some form of grazing adjustment is essential to insure permanent stands of forage.**

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