



WESTLAND PASTURE JOURNAL

VOL. 6, NO. 3

★ WHOLESALE SEEDSMEN SINCE 1884 ★

AUGUST, 1955

CALIFORNIA RANGE ROUNDUP

R. Merton Love, William A. Williams, and Lester J. Berry
University of California

A mixture of 50 per cent rose clover, 25 per cent crimson clover, and 25 per cent subclover has been proven to have wide adaptation to the valley and foothill range areas of California on shallow and infertile soils. These clovers succeed in both brush burns and in grass range seedings. They have repeatedly demonstrated their ability to produce in plantings representative of 3,000,000 acres of red terrace soils which previously were unable to support satisfactory stands of resident legumes.

The mixture should be seeded at rates of from 1 to 10 pounds per acre. A seeding of 1 pound per acre will generally develop into a full stand in four to five years. The higher rate should provide a full stand the second year. Many seedings are made with 3 to 4 pounds of seed per acre.

Since almost all California soils are nitrogen deficient, it is important to inoculate all legume seedings with fresh effective cultures of bacteria, so that nitrogen-fixing power of the legumes will come into operation immediately after germination.

A minimum of seedbed preparation is required for the mixture of annual clovers. A shallow disking prior to fall rains is usually sufficient. Stands can be produced by sowing directly on closely grazed sod as demonstrated by field plantings on the Chamberlain Ranch in Placer County and the Longhurst Ranch in Napa County, but establishment is more certain with a prepared seedbed and good seed coverage.

On deeper soils where rainfall is 15 inches or more, perennial legumes such as alfalfa or birdsfoot trefoil may be added or substituted. However, the competition from native grasses and weeds must be controlled to favor the slower developing seedlings of the perennials. A prior crop of sudangrass has been very effective in cleaning up land. Seed can be sown directly on the stubble without further preparation.



Rose clover production from a control burn seeding October 28, 1954, on the Manley Ranch, Badger, Tulare County, at 3000 feet elevation. July 15, 1955.

Photograph courtesy C. F. Walker, U. C. Field Station Staff

Early fall seedings are most likely to succeed except at high elevations where winter cold and frost heaving make early spring seedings best.

The two fertilizer elements that range legumes respond to most frequently are phosphorus and sulfur. At least three-quarters of the upland and terrace soils of the state, and this includes the bulk of range soils, are likely to give a significant response to phosphorous fertilizers on legumes.

SEED AND FERTILIZER PLACEMENT

Within the past five years considerable information has been published concerning the success of eastern experiments with the placement of phosphorous fertilizers in pasture seedings.¹ The practical importance of these principles has been amply demonstrated in California by Sumner² and others, and

¹ See *Westland Pasture Journal* 6:1, Feb. 1955, and *Agronomy Journal* 46:189-194, 1954.

² See *Westland Pasture Journal* 2:3, Aug. 1951, or *California Agriculture* 5:3, March 1951.

particularly during the past year in plantings made by the Shasta County Agricultural Extension Service on the Bartel and Charles ranches, and in an 86-acre planting in the Cleveland National Forest in San Diego County in cooperation with the U. C. Range Demonstration personnel where excellent stands of annual and perennial legumes and grasses have been obtained by this method.

The procedure consists of banding the seeds over rows of fertilizer drilled about one inch beneath the seed. This method has several advantages over broadcast methods. The emerging seedlings have immediate access to nutrients which may otherwise be unavailable in the soil, or if broadcast, may be scattered out of reach. Also by concentrating the fertilizer near the seed it is placed out of reach of many of the competing plants between the rows which could very well take advantage of a broadcast application. In addition, maximum efficiency is obtained by row placement of phosphorous fertilizer, a



Equipment used for placement of seed and fertilizer in the Shasta County Agricultural Extension Service test plantings. Mr. Walter Spivey, farm advisor (standing by the seeder box), designed modifications which make the planter effective.

Photograph courtesy Walter Spivey

good portion of which becomes fixed by soil colloids when broadcast, and hence, unavailable to plants.

Various pieces of equipment have been used to achieve the same basic results. The simplest of these consists of an inexpensive modification of a grain drill with a fertilizer attachment and a grass seeder box. In the band-drill method the fertilizer is dropped through the furrow openers as is commonly done when sowing grain. The furrow openers are set to deliver the fertilizer 1 to 2 inches below the surface of the closed furrow. The range seed mixture is then conveyed by tubing and dropped at a point far enough behind the fertilizer shoe so that the furrow has closed, usually 8 to 12 inches. The seed is dropped from a height of about 3 inches so that the seed is concentrated in a band on the surface of the closed furrow and is either covered by subsequent rolling, a press wheel, or by rainfall action. Inexpensive conversion kits for grain drills are available commercially.

ANNUAL LEGUMES

Rose clover was introduced into California eleven years ago, and it has since proven itself to be the most adaptable range legume available. Rose clover is a winter annual which germinates with the first fall rains and makes the bulk of its growth in the early spring. It is palatable to stock in both the green and dry state, and it contains about 12 per cent crude protein (dry basis) at full bloom and 8 per cent when completely mature with the seed heads partially shattered. Since it blooms later than other annual clovers, it extends the

green feed period. Rose clover produces satisfactorily on strongly acid to moderately alkaline soils up to approximately 4,000 feet elevation. Seed is plentiful and inexpensive.

Crimson clover, a colorful winter annual legume, is a heavy producer on much range land, but it is not adapted over quite as wide a range of difficult conditions as rose clover, nor is it as persistent. Its seedling growth is slightly more vigorous, and its mature growth somewhat taller than other annual clovers. It is useful as a hay plant as well as for grazing. Its feed value is on a par with that of rose clover, although it matures from one to two weeks earlier depending on the variety. Early indications from a variety testing program, which is now in progress, show that Dixie and related varieties originating from the southeastern United States perform well in California. Seed of adapted varieties is available commercially.

Subterranean clover, or subclover, is a low-growing winter annual which commonly develops runners up to four feet long. It has a unique ability to plant its own seed by burying its seed heads in the ground. These characteristics make it very tolerant to heavy, close grazing. Subclover is particularly well adapted to acid soils and coastal climate, but also does well in mixtures in the Valley and foothills. It is gaining recognition for its value as a competitive plant for control of such undesirable invaders as Medusa-head and hairy oatgrass when used with appropriate grazing management.

Mt. Barker, a midseason variety, has

wide adaptation and is, more or less, the standard variety. A late maturing variety, Tallarook, is useful in the north coastal region for extending the season. An earlier maturing variety, Bacchus Marsh, which is about ten days earlier than Mt. Barker, looks promising in preliminary tests for areas having a short rainy season. Additional testing needed to verify its usefulness is now in progress. Seed of Mt. Barker and Tallarook varieties is available.

Bur clover, a winter annual, is common to most lower elevation range areas except the granite-derived soils in the Sierra foothills. It is one of California's most valuable resident legume range species. The green plants of winter and spring, as well as the dried plants and burs of summer, are valuable high protein feed. Bur clover does not usually require seeding except where natural stands have been eliminated by cultivation, spraying, or encroachment by brush. Seed is available commercially.

PERENNIAL LEGUMES

Alfalfa is an important perennial hay plant which also has proven useful as a grazing plant on better range sites. It requires a deep, well-drained soil from slightly acid to moderately alkaline. As a seedling it is somewhat slower to start than the annual clovers and grasses and, therefore, is encouraged by adequate seedbed preparation to reduce volunteer competition. The availability of winter hardy varieties makes possible the use of alfalfa at high elevations where the annual clovers suffer from winter killing. Since it is a perennial and its deep-reaching tap root can use subsoil moisture reservoirs, it provides an extended period of green feed, but requires care since overgrazing by either livestock or rodents sets it back severely.

Where winters are mild, the improved variety, Caliverde, is useful, and at higher elevations such winter hardy varieties as Ladak or Ranger are used. Creeping rooted alfalfas have not demonstrated a clear-cut advantage as yet, although a promising new release from Canada is being placed under test at the present time. One pound per acre is an adequate seeding rate in mixtures.

Birdsfoot trefoil is a perennial legume which is being used more and more for range plantings on Coast Range sites. The seedlings are slow to establish, but once established the plants are very persistent. Birdsfoot trefoil will grow on less well-drained, more acid, and shallower soils than alfalfa.

The narrowleaf birdsfoot trefoil (prostrate birdsfoot trefoil) withstands grazing pressure well. It is the most tolerant legume to soil salinity. While it

is usually considered not suited to areas having hard, killing frosts, it has succeeded equally with broadleaf trefoil in small plots at 5,000 feet elevation near Vinton, Plumas County. There are successful field scale plantings in the Fall River Valley, Shasta County, where winters are severe.

The broadleaf birdsfoot trefoil (erect birdsfoot trefoil) is more resistant to winter cold and can be used at higher elevations. Its root system is deeper, and the plants are more drought resistant than narrowleaf. However, broadleaf trefoil is less tolerant of poor drainage than narrowleaf. There are a number of varieties of broadleaf birdsfoot trefoil available, and they are currently being tested for adaptation to various range areas of the state. Use a pound per acre of either in mixtures.

PERENNIAL GRASSES

The use of perennial grasses in range and dryland pasture seedings is steadily gaining ground. Their presence on the range helps provide stability to forage production, and extend the season.

Now that we know more about their adaptation and production possibilities, more simple mixtures are being used. However, on many range areas a variety of sites exists. For example, the Hollister Estate Company in Santa Barbara County uses a mixture of harding, smilo, veldt, and annual legumes in the mountain seedings. On the coast harding, tall fescue, and orchard are the perennials seeded with clovers.

On arable land, placing the seed by drill above a narrow band of appropriate fertilizer greatly improves stand establishment and growth the first year. This is more fully explained earlier in this article.

Hardinggrass is, without question, the outstanding perennial range grass in use in California at the present time. It is widely adapted. It is hardy, and once established, it is extremely durable. Successful stands can be found in all regions of California except the colder, high elevations and desert zones. It does well from Del Norte to San Diego County in the coast ranges and from Shasta County to the Tehachapis in the Sierra foothills. Certainly where the brush grows thick and tall, harding can be seeded in the cleared areas. At lower elevations in the Sierra Nevada the chief limitation is probably soil depth. If the soil is three feet deep, harding will be useful. It is a good plant to use with the annual legumes. Use four pounds of seed to the acre in such dryland plantings.

Smilo has been in the state many years, but it has not yet reached the prominence it deserves. Except in sandy soils

its use is limited to seeding in the ash of brush burns. It is not as palatable as harding, but it is very hardy and remains green longer than most other species. Although there are more than a million seeds in a pound, a high percentage of the seed has the characteristic known as delayed germination. Now that the seed is cheap, two or three pounds can be used in the mixture where formerly only half a pound might have been used. It is one introduced perennial well adapted to chamise sites, and with veldt and harding, does very well on coastal sage areas.

Orchardgrass is used in dryland pasture and burn seedings in the north and central coast ranges and at intermediate elevations in the Sierra. It is not as drought-tolerant as harding, smilo, and veldt. A pound to the acre is sufficient in mixtures. **Akaroa** orchardgrass should only be used in the most favorable dryland sites, since it is primarily a selection for irrigated pastures.

Tall fescue has not apparently given any trouble in range seedings and is widely used. A long season of growth and high forage production can be expected on the range in areas of 20 inches of rainfall or more. Three varieties are available in the California seed trade: Goars (from California), Alta (from Oregon), and Kentucky 31. In general, they are quite similar, and price is the deciding factor. Goars tall fescue appears to be somewhat more alkali tolerant. Use a pound or two to the acre in mixtures.

Veldtgrass combines the attributes of an annual and a perennial better than most. It has strong seedling vigor; it volunteers well; and it is very palatable. It is the highest priced range grass seed on the market in California, but worth every cent it costs in the areas where it is adapted. This high price is due to the difficulties encountered in seed harvest. A new type that holds its seed better compares favorably with standard veldt, and the new variety should be available in a few years. This should result in lower priced seed.

Veldt is particularly well adapted to coastal range areas from Marin County to San Diego County, especially on light, sandy soils. There is even a successful seeding near Petrolia in Humboldt County. The Andrews Ranch, near Arroyo Grande, San Luis Obispo County, has over 400 acres seeded to veldt. The Hollister Ranch, Santa Barbara County; the Broom Ranch, Ventura County; and the Forward Ranch, San Diego County, have had excellent results in trial plantings. Use a pound or two to the acre. It is not adapted to cold areas.

Smooth brome is well adapted to mountain meadows and timber areas of the state. It now appears that Manchar is the best of this species for use in California mountainous areas.

Intermediate wheatgrass is a relative newcomer, but it has been tested adequately at higher elevations. Where rainfall exceeds 20 inches, it will produce much more forage than crested wheatgrass. It is quite aggressive and quickly forms a good sod. A new strain, Greenar, is now available, and seed is being produced commercially in Surprise Valley, Modoc County.

Mountain brome is short-lived perennial grass. As the name implies, it is best adapted to intermediate and higher elevations. It can be broadcast in the weeds in some mountain glades and meadows and gradually builds up an excellent stand. The strain Bromar is best adapted to California conditions.

Perennial ryegrass, a short-lived perennial, is useful only on the better sites. It is not as highly competitive as annual ryegrass, but should be used with caution in mixtures.

ANNUAL GRASSES

The number of annual grasses in use for range seedings is rather limited, but they are widely adapted.

Annual (domestic) ryegrass is probable most widely used. It performs best at elevations above 2,500 feet and in the north coast region. It gives good first year stands in brush burns, but it persists in relatively few areas of the state. If perennial grasses and annual legumes are seeded with it, ryegrass should be used sparingly, not more than a half pound per acre, because it is so highly competitive.

Soft chess is now available commercially. A strain called Blando brome has been recommended for certification. Although this seed will be rather expensive initially, ranchers would be advised to use it in mixtures on brush burns since it does not seem to be as highly competitive as ryegrass. Research on this is now being conducted.

Wild oats are occasionally used in brush burn seeding mixtures but only because slender wild oats are not available. It should be recognized that wild oats are not too well adapted to most range sites, but they do provide a quick cover the first winter, and are, of course, good nutritious feed.

LIVESTOCK USE

Good management of a range seeding is just as important as good management of any other crop. There are many examples of increased production

WESTLAND PASTURE JOURNAL

Published by

Northrup, King & Co.

Research-Service Department

Berkeley 1, California

ALLENBY L. WHITE, *Editor*

Vol. 6, No. 3

August, 1955

Permission is granted to reprint material contained herein provided full credit is given to the *Westland Pasture Journal* and the date of issue shown.

of irrigated pastures by intensive management. In much the same manner, rotation of the stock on dryland pastures results in higher production and fewer weeds. J. K. Sexton, Glenn County, for example, has increased pounds of beef per acre some three and a half times in a field of harding, alfalfa, rose, and crimson clover by good management.

A seeding in the ash of a brush burn becomes better established if stock are kept off the first season until the seeds begin to shatter. Perennial grasses and annual legumes do well in burned areas because there is usually no competition from resident annuals. Where there is competition from annual grasses or sprouting brush, an early grazing is helpful.

On the other hand, with the best of preparation, it is difficult to have a weed-free pasture on abandoned cropland or on other arable grassland areas. The resident annual grasses grow faster than the perennial grasses or the annual legumes. Therefore, a heavy grazing once or twice the first spring is recommended. It is almost impossible to harm a new seeding the first spring by "overgrazing." The important thing is to remove the stock well before the last spring rains to allow the seeded species to mature a seed crop. Graze the field again before the fall rains to trample the seed into the ground and so thicken up the stand.

After stands are established, both types of seedings (on brush burns and on grassland) can be treated in the same manner.

FERTILIZATION OF NATURAL RANGE

Results from a large number of tests indicate the fall application of nitrogen fertilizers will result in early and continued winter growth of annual grasses during the time when little or no growth is normally expected. On soils containing adequate phosphorus, the application of nitrogen alone makes as good early and total growth as do nitrogen-phosphorus combinations. On soil with acute phosphorus deficiencies, little growth will occur from the application of nitrogen unless adequate phosphorus is also added. Some

soils show seasonal or winter deficiencies in phosphorus. Here nitrogen and phosphorus both are required to produce early winter growth, while nitrogen alone will make as good a spring growth as will combinations of the two materials.

On sulfur-deficient soils the application of nitrogen and sulfur materials will produce better growth than from equal amounts of nitrogen alone. There are areas where soil deficiencies are so acute as to require combinations of nitrogen, phosphorus and sulfur to produce adequate growth.

A good illustration of the potential importance of sulfur in range improvement work is the response of rose clover on Snelling sandy loam in Stanislaus County. In a test there volunteer feed, mostly broadleaf filaree, produced 1,080 pounds per acre of dry matter. Unfertilized rose clover increased the feed to 1,970 pounds per acre. The addition of 500 pounds per acre of gypsum to rose clover increased range feed to 3,080 pounds per acre. Surprisingly enough, gypsum on the native feed increased it a negligible amount to 1,120 pounds per acre. This not only clearly demonstrates how important sulfur can be in increasing forage yields, but also how important it is to have a plant available, like rose clover, for example, which can take advantage of improved fertility.

It seems clear that where nitrogen is applied to ranges special livestock management must be applied so that the increased feed is properly used. Stocking rates must be so adjusted as to use the early maturing grasses so that they do not crowd out the later maturing and usually more nutritious grasses. Likewise, the increased total grass growth resulting from the nitrogen stimulation must be used sufficiently so that legumes are not reduced in the population. In general, nitrogen treated ranges should be grazed heavily, early. After the peak of the growing

season, grazing pressures should be reduced or removed entirely while there is still moisture enough left to produce seed.

Legume fertilization with phosphorus or sulfur is directed primarily toward improving quality of feed and results in a greater proportion of high protein legume vegetation in both the green and dry feed. A residue of organic nitrogen is usually left in the soil which stimulates grass growth the next season.

SUMMARY

In a few words then, here are the possibilities.

1. Earlier fall feed can be made available on native range by fertilizer application in the fall. Nitrogen gives a good response if phosphorus and sulfur are not deficient. Depending on the soil, it may be necessary to use a combination of elements.

2. Annual reseeding legumes or fertilized native legumes can be used to provide an abundance of nutritious feed from mid-spring on, and good dry feed during the summer and fall.

3. Perennial-annual mixtures on the better sites will lengthen the season of use by providing green feed earlier in the fall and later in the spring. A good mixture is comprised of 50 per cent perennial grasses and the remainder legumes, using 5 to 10 pounds of seed per acre of the mixture. Such dryland pastures make an ideal supplement to the unimproved range, whether or not irrigated pasturage is available on the ranch.

4. Placing the seed and fertilizer in bands helps assure a good stand of legumes and hard-to-start perennial grasses the first year.

5. Attention to livestock use — harvesting the forage while at its prime, but allowing the plants to recover before the last spring rains, and a late summer clean-up grazing—ensures the stability of the grassland crop.