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PLANTS FOR ROADSIDE SEEDINGS IN SIERRA NEVADA FOOTHILLS

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Past seedings of roadsides and other non-irrigated critical areas in California have depended primarily on annual or Italian ryegrass (Lolium multiflorum Lam.) plus massive applications of nitrogen fertilizers to establish ground cover in minimum time at minimum cost. This species and the high fertilizer rate, however, have several important disadvantages. Ryegrass is adapted only to conditions of high fertility such as created by adding fertilizer. When the fertility goes, so will the ryegrass. In any case, it may not set seed on shallow soils or in the short seasons which may be encountered on California roadsides. Being an annual, it requires seed production to be present in the following year.

High rates of fertilizer in combination with ryegrass result in a large amount of plant material--much in excess of what is necessary for erosion control--and excess fertilizer may be released into runoff water. The heavy mat of dry grass is a fire hazard in the summer and may restrict establishment of the plants in the following winter. This old grass prevents seed from reaching mineral soil, which it must do to germinate and get its roots down. The mass of decaying ryegrass roots tie up all available nitrogen, giving it the reputation of "poisoning the soil." Also, the excessive shade produced may prevent the growth of new seedlings. As little as 1,000 lbs/acre dry matter may restrict growth in low rainfall areas such as Madera County (17 inches), because of the low decomposition rate, while it may require 4,000 to 5,000 lbs/acre to be a problem in the the Berkeley hills with rainfall in excess of 25 inches. Ryegrass clipped from the contract seeding at Applegate was 10,600 lbs/acre and a lodged mat up to 4 inches deep resulting from the use of Wimmera 62 ryegrass and 14-14-7 at 880 lbs/acre.

Frequently there are almost no plants--not even weeds--in the second year, only a mat of dead ryegrass. The competitive nature of ryegrass also precludes the use of showy plants such as poppies, lupines, or shrubs in the mix.

A study was therefore undertaken to find better plants with lower nutrient requirements. The specific aims were adequate ground cover that would perpetuate itself and have a desirable appearance, minimum fire hazard, and low maintenance while allowing the establishment of lupine or poppies.

Procedure

The experimental site is a newly constructed segment of Interstate 80 about 2.3 miles west of the town of Applegate at an elevation of 1720 feet on a south-facing slope. The site was prepared in steps or

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benches about 18 inches deep and 24 inches high. The soil appears to be Mariposa, and the steps of poorly bonded shale. There was very little topsoil present on the steps.

Three annual grasses, three annual legumes, and three perennial grasses were compared. The three annual grasses were Italian ryegrass, Wimmera ryegrass (Lolium rigidum Gaud.), and Blando brome (Bromus mollis L.). The three annual legumes were cultivars of rose clover (Trifolium hirtum All.): Wilton, Hykon, and Olympus. These were pellet-inoculated before seeding.^{1/} The three perennial grasses were summer-dormant cultivars of orchardgrass (Dactylis glomerata L.): Palestine, Berber, and Kasbah. All were seeded at 50 lb/acre with wood fiber at 1,000 lb/acre, and water at 3,000 gpa, using a Spray Baby hydroseeder. All plots were fertilized with ammonium phosphate-sulfate (16-20-0) at 500 lb/acre. Each trial was 1,089 sq. ft. and the full height of the cut slope.

In addition to the above, all plots except orchardgrass were seeded to a mixture of shrubs and poppies as follows: buckbrush (Ceanothus cuneatus (Hook.) Nutt.) at 1 1/4 lb/acre, Lemmon ceanothus (Ceanothus lemmonii Parry.) at 1 1/4 lb/acre, deer brush (Ceanothus integerrimus H. & A.) at 1 1/4 lb/acre, California poppy (Eschscholtzia californica Cham.) (grown in Davis) at 1 1/4 lb/acre and Toyon (Heteromeles arbutifolia Roem.) at 20 lb/acre as fresh fruit picked locally. The Toyon fruit was allowed to circulate with wood fiber and water for about 10 minutes in an effort to crush the berries. The only result was that a portion of the tough red epidermis was scalped from about 1/3 of the fruits. This same mixture of shrubs was also seeded alone at one location.

All trials were planted much later than desirable. The annual grass and clover were planted on December 1, and the orchardgrass on December 20.

Results

All grass and legume cultivars established well despite the late planting date, cold winter, and poor soil conditions. Growth, however, was much less than would be expected from an earlier planting.

Ryegrass seedlings developed only slightly faster than Blando brome. There was no difference between ryegrasses on Feb. 9. By March 10 both ryegrasses were drying in the vegetative stage, while Blando brome was still green. On March 20, 20% of the Blando brome had headed while the ryegrasses were still vegetative. On April 26 all of the Blando brome had developed to at least anthesis while Wimmera ryegrass was just emerging from the boot and Italian ryegrass was still vegetative. Late rains saved the ryegrass. All grasses made some seed. However, the Blando brome set seed 2-3 weeks earlier than either annual ryegrass and set a much larger volume of seed. Wimmera ryegrass flowered about 2 weeks earlier than Italian ryegrass and also set more seed.

The orchardgrasses all established well and offered excellent ground cover early in the season. Palestine made the most growth by June 20, 1972. All three cultivars were still green at that date. All varieties dried approximately July 1. Only Berber flowered extensively. Survival will

^{1/} For further information on legume inoculation see "Pellet Inoculation of Legume Seed" by A. A. Holland, and J. E. Street, University of California, Agricultural Extension Service, AXT-280, 5 p.. Sept. 1968.

be determined in the winter of 1972-73.

The three rose clovers varied by several weeks in date of maturity. However, Wilton (the latest-maturing) made the best growth and produced the most seed.

Shrub counts are incomplete. There are a few Ceanothus sp. and Toyon. Although the numbers are not great they are adequate to landscape the site if they survive. The best stands are near the top of the slope where topsoil has covered them. Also, best stands are associated with the clovers or where the shrubs were seeded alone.

California poppies did well when seeded with clover or alone, but are not evident in any of the annual grass stands.

Discussion

Blando brome appears the best adapted of the three annual grasses tested. However, it may be too competitive to be seeded with poppies or shrubs. It can probably be grown successfully with much lower fertilizer rates than can ryegrass. Seed of Blando brome is available in quantity.

Wilton rose clover not only grew well, but also allowed a good stand of poppies to become established, as well as a few shrubs. The general appearance was much superior to that of the annual grasses, partially because of the rose-colored blossom. Properly inoculated clover may be grown without nitrogen fertilization if phosphorus and sulfur are added. Wilton rose clover seed is available in quantity. Crimson clover, although not tested here, would be a colorful addition and adapted for at least two years. Clovers did not develop as rapidly as annual grass and did not offer as good early season erosion control.

Low-growing perennial grasses such as summer-dormant orchardgrass might be superior to annual grass because of their low fuel volume, prolonged green period, and rapid winter growth. Perennial grasses have the added advantage of having to surmount the difficulties of establishment only one time. This may be an advantage on loose steep slopes, which are constantly moving, and thus make it too difficult for annuals to start in some years. Summer dormant cultivars of orchardgrass are superior to some other perennial grasses in that, they are low in total production. Of the three tested, only Palestine is available commercially.

Shrub establishment may be successful by direct-seeding on steps. The crumbling of the steps covers the seed and is undoubtedly the reason for the success. If steps are not included in the construction it would be more desirable to "spot seed"---actually placing the seed in a hole with fertilizer and covering it lightly with soil.^{2/} This would, of course, require much less seed, but more labor. Seed of these species is not always available and may be very expensive to use in a broadcast seeding. To assure a supply it would be well to order shrub seed about 18 months before the seeding date.

^{2/} For further information on spot seeding see "Direct seeding of woody plants in the landscape" F. T. Chan, W. Harris, and A. T. Leiser, University of California, Agricultural Extension Service, AXT-N27, 12 p. November, 1971.

Conclusion

The use of a mixture of Wilton rose clover, poppies, and shrubs would be superior in appearance to annual grass, and less of a fire hazard. This mixture would have the added advantage of not needing as much fertilizer and regenerating naturally in future years. It may not give as good erosion protection in the early season as annual grass.

If an annual grass is to be used for maximum site protection without interest in shrubs or poppies, the grass used should be Blando brome. Either cultivar of ryegrass may be used if it is not important that the grass grow again the following year.

A summer dormant orchardgrass may have a place, but requires further testing before it can be recommended.

Either mixture should be fertilized with 16-20-0 at 500 lb/acre at seeding. This will provide adequate nitrogen, phosphorous, and sulfur. It need not be fertilized again in future years.

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