Reseeding Burned Rangeland

competition between annual and perennial grasses studied to determine best seeding rates for good forage

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Seed mixtures used for reseeding forage land should be so adjusted as to seeding rates that annual and perennial grasses can become established in desired amounts.

Some species of grasses—annuals like domestic ryegrass—are more aggressive than others and are excellent competitors, and some perennial grasses—such as hardinggrass—are at a disadvantage when growing in stands with the ryegrass.

Each year many acres of burned brushlands in California are reseeded and—on the better soils—several species of forage plants are well adapted for this purpose.

A commonly used reseeding mixture is one with varying amounts of annual ryegrass, legumes and perennial grasses, but the grasses in such mixtures may not come up in the same proportion as that in which they were seeded.

Whether greater density and higher yields—for both annuals and perennials—can be obtained when more seed is used; how the rate of seeding of the annuals and of the perennials affect the density and yield of each other; and which affects the density and yield of the perennials most, the rate of seeding of the annual, or that of the perennial itself were questions studied in investigations started in October 1950.

Experimental Seeding

The study was made near Ahwahnee, Madera County, in an area at about 2,600 feet elevation which was burned in August 1950.

The soil is classified as Holland sandy loam, a soil five to six feet deep. The plant cover before burning consisted chiefly of chaparral whitethorn, Mariposa manzanita, interior live oak, and digger pine. The fire was intense, killing the tops of all plants and consuming everything but the larger stems of the live oaks and pine trees. A thick layer of white ash covered the ground.

The experimental reseeding was done by hand on the ashes in early October 1950. The first rain after this was on October 23. By the end of that month 2.6″ of rain had fallen—enough to start germination—and the total rainfall for the year was several inches above the average of 28″.

Domestic ryegrass was used in the study as the annual and hardinggrass, tall fescue, and smilo as the perennials. The three species of perennials reacted similarly.

The design of the experiment was that of a split-plot factorial with four whole plots and six subplots. Individual plots were 25′ by 40′ in size.

The whole plot rates of seeding of the hardinggrass were one, two, three, and four pounds per acre. The subplots rates of seeding of ryegrass were 0, three, six, nine, 12, and 15 pounds per acre. This resulted in 24 combinations. The combinations were replicated in three blocks. Analyses of variance were used to test the significance of the effects of rates of seeding on foliar density, forage yield, and numbers of perennial plants.

Density of the ryegrass stands—measured in April—was increased markedly where the seeding rates had been increased from three to six pounds per acre. The density was still greater where the seeding rate was nine pounds, but there was no greater density where the rate was increased to 12 and 15 pounds per acre.

Individual plants in plots seeded at the lower rates had up to 70 tillers—shoots—by early April, but in the more heavily seeded plots a maximum of 20 tillers per plant was found. Thus, profuse tillering of plants in the sparser stands more than compensates for the greater numbers of seedlings in thicker stands in contributing to high foliar density.

Density of hardinggrass increased with each increase of one pound per acre in its

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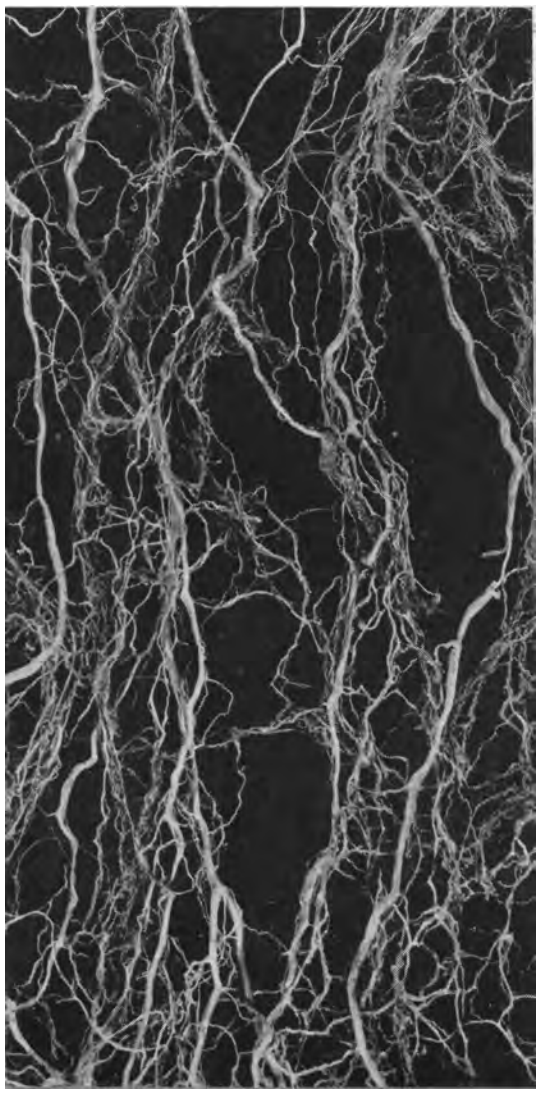

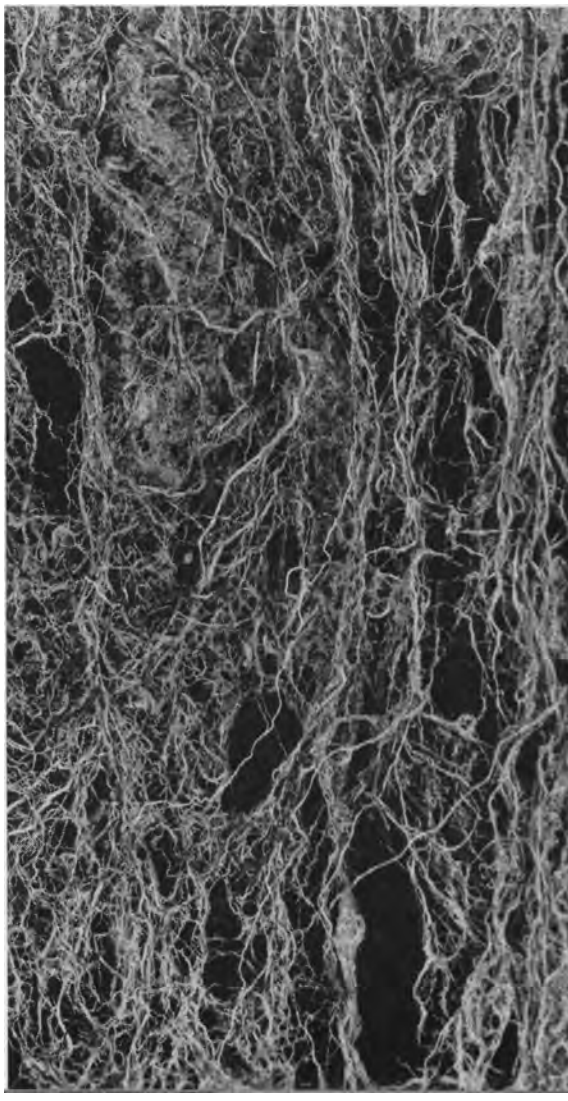

A comparison between hardinggrass—*left*—and domestic ryegrass—*right*—roots. Roots were taken from blocks of soil 4″ thick, 6″ below the crown of the two plants. Weight of ryegrass roots in an equal volume of soil was 2.3 times that of hardinggrass. Roots are shown in life size.

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seeding rate up to four pounds. The optimum rate can not be discerned from this study.

Yields

Yield of ryegrass—measured in July—was highest where that annual was seeded at six pounds per acre. At higher rates of seeding, yields were lower.

The amount of hardinggrass seeded had no significant effect on either the density or yield of the ryegrass.

Yields of hardinggrass depended both on its rate of seeding and on that of the ryegrass.

Hardinggrass yields increased consistently with each addition of one pound of seed per acre of hardinggrass seeded, but decreased proportionately with each addition to the seeding mixture of three pounds per acre of ryegrass seed. Yields of hardinggrass were extremely low when ryegrass was seeded at more than three pounds per acre, no matter what the rate of seeding of hardinggrass. Therefore, the establishment of a good stand of hardinggrass depends far more on how much ryegrass is seeded with it than upon the amount of hardinggrass seeded.

Competition

In combinations of seeding involving annuals and perennials, the annuals have the advantage in competition for soil moisture and nutrients because of earlier germination and faster growth.

In the present study nearly all the ryegrass seedlings had emerged before any of the perennial grass seedlings had started. There was a time-lag of approximately three weeks for hardinggrass and seven weeks for smilo in seedling emergence after the ryegrass had emerged. Presence of the already well established ryegrass may have retarded the germination of perennial grass seed or at least obstructed the emergence of some of the seedlings. During the early stages of development of both types of seedlings, there was sufficient moisture in the soil for plant growth. Yet, mortality of both perennial and ryegrass seedlings was noted at that time. If this mortality can be attributed to competition, then probably it was caused by factors other than insufficient water.

Roots of annual ryegrass are faster growing than those of the perennials but as yet little is known about the relative efficiency of the root systems in absorbing soil moisture. It appears from a comparison of the root systems that the ryegrass roots penetrate the soil more thoroughly than do the hardinggrass roots.

The earlier germination and faster growth of the annual is a definite and measurable disadvantage for perennial grass establishment. It results in crowding out a large number of perennial seedlings early in the season, and more later on. Later in the season it results in stunting the growth of many of the perennial plants whose roots are near the ryegrass.

The question as to whether the retarding effect of the ryegrass on the perennial grass during the first year of growth will be noticeable over a longer period of time must be answered before the results of this study can be used in recommending seeding rates.

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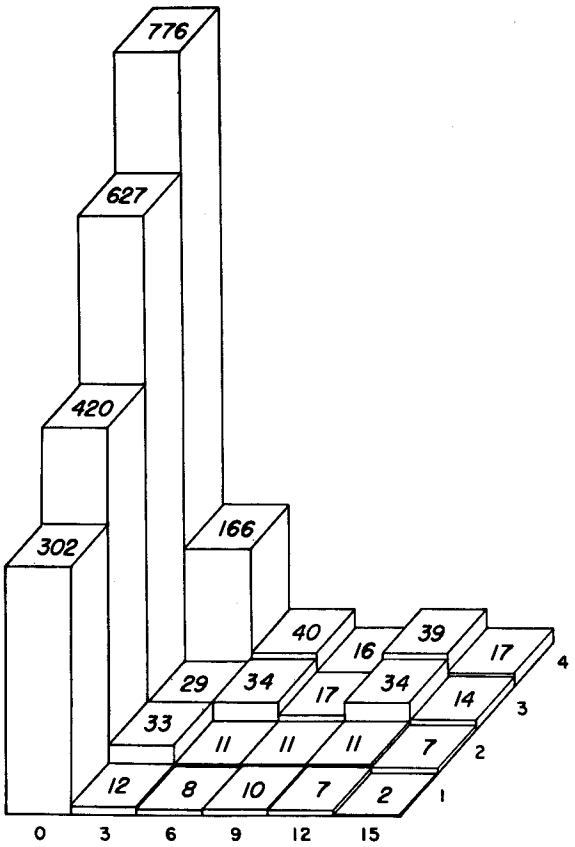
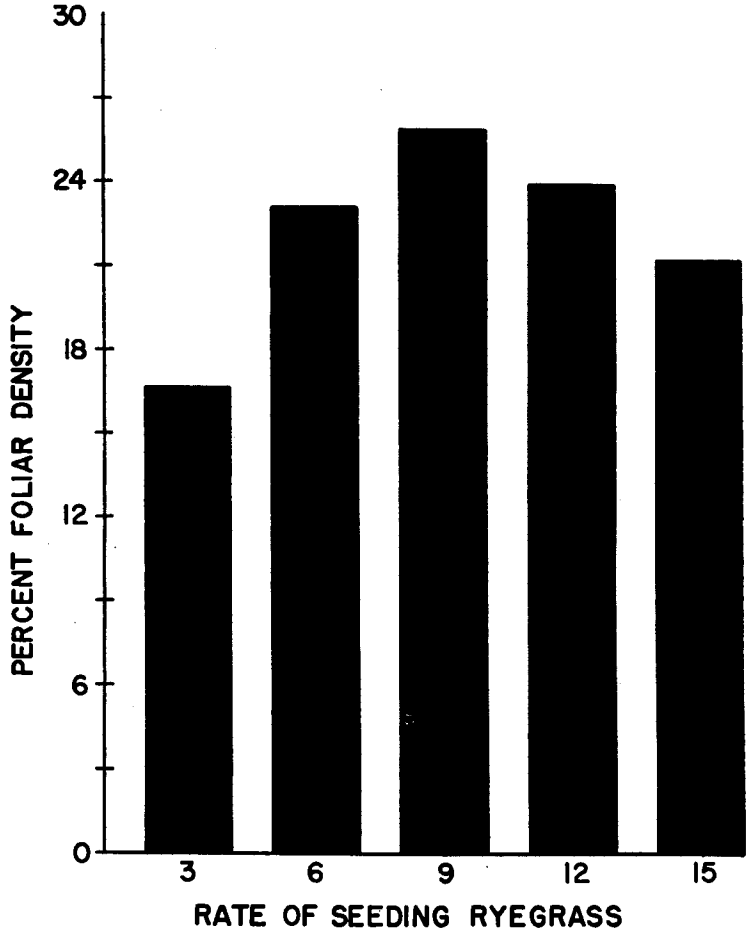


Yields of hardinggrass in pounds per acre with increasing rates of seeding of hardinggrass—*front to back*—and increasing rates of seeding of ryegrass—*left to right*.



Foliar density of domestic ryegrass in April, seeded at five different rates. Approximately half of the maximum number of tillers had been produced at this time.