Seeding Rates and Row Spacings for Rangelands in Southeastern Idaho and Northern Utah¹

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Highlight

A mixture of five grasses and one legume was seeded at 3, 6, 12, and 24 lb./acre spring and fall for 4 years (1962–66) at a high elevation. A mixture of three grasses and one legume was similarly seeded for 2½ years (1964–66) at a low elevation. To get a good stand within a reasonable time at least 6 lb./acre should be seeded at the low elevation and 12 lb./acre at the high elevation.

Estudio de Cuatro Años sobre Intensidades y Distancias de Siembra en Pastizales Naturales en Los Estados de Idaho y Utah, E.U.A.

Resumen²

Se sembró una mezcla de gramíneas y tréboles adaptados de las regiones a las intensidades de 3, 6, 12 y 24 libras de semilla por acre a varias distancias: entre surcos de 6 y 12 pulgadas y se sembró al volco. No hubo diferencias significativas entre las diferentes distancias de siembra con respecto al porcentaje de plantas de los semilleros. Pero, disminuyó el porcentaje de plantas de los semilleros con el aumento en la intensidad de siembra. La intensidad de 3 libras de semilla por acre fue más recomendable pero hubo diferencias entre localidades.

Mueggler and Blaisdell (1955) reported results from drilling crested wheatgrass (*Agropyron desertorum* (Fisch.) Schult.) at 2, 4, 8, 12 and 24 lb./acre on the Snake River Plains of Idaho. The highest rates gave the best stands for the first 3 years, but by the sixth year all stands produced similarly. They recommended 8 lb./acre to produce a satisfactory stand within a reasonable time. Hull and Holmgren (1964) drilled fairway wheatgrass (*Agropyron cristatum* (L.) Gaertn.) at rates of 1, 2, 4, 6, 8, 10, 20 and 40 lb./acre in southwestern Idaho. All stands were approximately the same at the end of 10 years. They concluded that low seeding rates produced thin stands which were slow to reach full productivity and allowed invasion of undesirable plants. They recommended 5 to 7 lb./acre for fair-

way wheatgrass and gave specific rates for other species.

Cook et al. (1967) seeded four wheatgrasses at low to high rates in Utah. They recommended at least 5 lb./acre viable seed of crested wheatgrass, with higher rates for the larger-seeded wheatgrasses. Also in Utah, Vallentine et al. (1963) recommended 6 to 9 lb./acre on sagebrush areas and 9 to 11 pounds on mountain brush and aspen areas.

In the Intermountain area, Plummer et al. (1955) recommended 4 to 8 lb./acre of good seed for drilling and 8 to 14 for broadcasting. These amounts should be doubled where a quick cover is needed. Springfield (1965) tested 2, 4 and 6 lb./acre in New Mexico. The two lower rates were slow to produce a full stand, but 5 years after seeding, yields from all rates were approximately the same. Reynolds and Springfield (1953) recommended 6 lb./acre of crested wheatgrass with higher rates on moist sites in the southwest.

Spring and fall seedings of 6, 12 and 18 lb./acre in 1961–62 at the experimental site in southeastern Idaho indicated that seeding rates of at least 12 lb./acre were advantageous in the establishment of seeded stands. This study followed these preliminary results.

Experimental Sites and Procedures

The first and the major experimental site is at Franklin Basin in southeastern Idaho. It is an opening dominated by annual weeds in the spruce-fir type. The dominant species is tarweed (*Madia glomerata* Hook.), with considerable bushy knotweed (*Polygonum ramosissimum* Michx.) and colomia (*Collomia linearis* Nutt.). A thick growth of fleshy-rooted plants such as bicolor biscuitroot (*Lomatium leptocarpum* (Torr. and Gray) C. and R.) and lanceleaf spring beauty (*Claytonia lanceolata* Pursh) occurs in the spring. The elevation of this area is 8,400 feet with an annual precipitation of 46 inches. The soil is a clay loam, low in organic matter.

This study was repeated, mainly as a check, near Logan, Utah, 23 miles southwest of Franklin Basin. This is a formerly cultivated bench area at 4,800 feet elevation. Annual precipitation is approximately 17 inches. The soil is a deep, productive silt loam.

We planted a mixture at 3, 6, 12 and 24 lbs./acre by drilling at both 6- and 12-inch row spacings and by broadcasting each spring and fall for 4 years (fall 1962 to spring 1966) at Franklin Basin and for 2½ years (spring 1964 to spring 1966) at Logan. Plots were 6 by 10 feet. There were 4 replications of each treatment.

At Franklin Basin six species comprised the mixture: Intermediate wheatgrass (*Agropyron intermedium* (Host) Beauv.), slender wheatgrass (*Agropyron trachycaulum* (Link) Malte), meadow foxtail (*Alopecurus pratensis* L.), tall oatgrass (*Arrhenatherum elatius* (L.) Presl), smooth brome (*Bromus inermis* Leyss), and birdsfoot trefoil (*Lotus corniculatus* L.). At Logan the mixture was crested, fairway, and intermediate wheatgrasses, and alfalfa (*Medicago sativa* L.). All grasses were equal in weight with the legume weight being half that of any grass. Seed was weighed for each

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Table 1. First and second year plants/ft² and fifth year relative success ratings¹ for a mixture drilled at 2 row spacings and broadcast at 4 rates per acre at Franklin Basin. Figures are the average of 4 spring and 4 fall seedlings (1962-66).

Row spacing	Pounds seed per acre				
	3	6	12	24	Average
First year seedlings					
Broadcast	1.7	2.9	6.4	11.8	5.7
6" rows	2.2	3.8	6.2	10.7	5.7
12" rows	1.5	2.7	5.1	8.3	4.4
Average	1.8	3.1	5.9	10.3	5.3
Second year plants					
Broadcast	1.1	1.9	3.7	5.6	3.0
6" rows	1.1	2.0	2.9	4.9	2.7
12" rows	.9	1.5	2.1	3.4	2.0
Average	1.0	1.8	2.9	4.6	2.6
Fifth year ratings					
Broadcast	5.2	6.0	7.4	8.4	6.8
6" rows	5.4	6.5	7.4	8.4	6.9
12" rows	5.6	6.3	7.4	8.1	6.9
Average	5.4	6.3	7.4	8.3	6.9

¹ Ratings on a 0 to 10 basis with 10 indicating a perfect stand of grass (Hull, 1954).

broadcast plot and for each row of the drilled plots. Seeding rates are based on the amount of live pure seed. The amount of seed actually used averaged 20% higher than the amount of seed shown. The number of live pure seeds sown /ft² at 3 lb./acre was 22 at Franklin Basin and 12 at Logan.

Areas to be seeded were plowed and harrowed 2 or more times to give a firm seedbed. We drilled the seed to an average depth of ½ inch with a hand-pushed cone seeder. Broadcast seed was sown by hand on a freshly harrowed seedbed. Soil from outside the plots was thrown on the seed. Plots were then raked and walked on to approximate packing of the drilled plots. As most broadcast seed was in harrow depressions, it was covered up to 1 inch with an average of ½ inch.

Seedlings were counted after full emergence and at the close of the first two growing seasons. Ratings on a 0 to 10 basis, with 10 indicating a perfect stand of grass (Hull, 1954), were made during the third and fifth growing seasons at Franklin Basin and during the third growing season at Logan. Fifth year ratings were also planned at Logan, but the experimental area was torn up to be used for other purposes. However, stands were more fully established in 3 years at Logan than in 5 years at Franklin Basin.

Results and Discussion

Counts of seedlings and 2-year-old plants and stand ratings are shown in Tables 1 and 2. Considering that 22 seeds/ft² were seeded at the 3 pound rate at Franklin Basin and 12 at Logan, seedling emergence and survival were low. Enough plants emerged to produce fair to excellent stands. However, mortality reduced plant numbers at the

Table 2. First and second year plants/ft² and third year relative success ratings¹ for a mixture drilled at 2 row spacings and broadcast at 4 rates per acre near Logan. Figures are the average of 3 spring and 2 fall seedlings (1964-66).

Row spacing	Pounds seed per acre				
	3	6	12	24	Average
First year seedlings					
Broadcast	1.9	4.6	9.0	16.1	7.9
6" rows	2.5	4.4	9.5	16.1	8.1
12" rows	2.5	4.6	7.7	15.1	7.5
Average	2.3	4.5	8.7	15.8	7.8
Second year plants					
Broadcast	1.2	2.9	5.2	8.4	4.4
6" rows	1.6	2.7	5.3	8.9	4.6
12" rows	1.5	2.9	4.4	8.3	4.3
Average	1.4	2.8	5.0	8.5	4.4
Third year ratings					
Broadcast	6.6	8.1	9.0	9.6	8.3
6" rows	6.8	8.4	9.5	9.9	8.7
12" rows	7.0	8.9	9.3	9.8	8.7
Average	6.8	8.5	9.3	9.8	8.6

¹ Ratings on a 0 to 10 basis with 10 indicating a perfect stand of grass (Hull, 1954).

low seeding rates to less than the number needed for good stands. Survival of emerged plants at the end of the second growing season averaged 49% at Franklin Basin and 56% at Logan.

Species

All species in the mixtures grew well on both sites. At Franklin Basin separate grass and legume counts made only during the last 2 years showed that birdsfoot trefoil comprised 11% of the spring seeded stands and 10% of the fall seeded stands. At Logan alfalfa and grass were counted separately in all years. Here alfalfa averaged 14% of the spring seeded stands and 5% of the fall. Though legume seedlings often suffered higher mortality than grass seedlings, there was still a good proportion of legumes in most established stands.

Location

Logan averaged better than Franklin Basin. Two exceptions were the fall of 1964 and the spring of 1966. Logan seedlings in the fall of 1964 had poor emergence and 60% were lost because of frost heaving in March of 1965. In the spring of 1966 there was poor emergence and a 69% summer drought loss.

Seasons and Years

Spring seeded stands generally averaged better than fall seeded stands (Table 3). Exceptions were

Table 3. First-year seedlings and second-year plants/ft² from the different years and seasons of seeding at Franklin Basin and Logan. Average of 4 rates and 3 spacings.

Year and season of seeding	Franklin Basin		Logan	
	Seedlings	Plants	Seedlings	Plants
1962 Fall	.9	.5	—	—
1963 Spring	5.9	3.2	—	—
Fall	2.1	1.6	—	—
1964 Spring	7.1	5.4	10.8	7.9
Fall	9.7	3.0	4.1	2.4
1965 Spring	6.4	1.6	14.6	8.3
Fall	2.7	1.4	4.7	2.3
1966 Spring	7.5	3.9	4.9	1.3

the spring of 1965 at Franklin Basin and 1966 at Logan. Both of these springs were followed by dry summers which resulted in high seedling mortality. The relatively poor emergence and survival from Franklin Basin seedlings in the fall of 1962, 1963, and 1965 resulted from frost heaving in late fall and early spring. Seedling emergence counts may be low at both locations because plants killed by frost heaving often dry up and are not visible to be counted as having emerged.

Spring seedings were usually better than fall seedings because spring plowing gave better control of annual weeds during the summer than did fall plowing. Thus spring seeded plants established themselves better during the first growing season than did plants seeded the previous fall. Spring seedings in this study were made with hand and small motorized machinery. Large-scale seedings with heavy machinery would not be feasible in the spring, especially on mountain lands.

Row Spacing and Broadcasting

There was little difference among 6- or 12-inch rows and broadcast treatments. The slight reduction of plant numbers in 12-inch rows was that plants were confined to a smaller space and grew together so that two or more plants were often counted as one. The good showing from broadcasting was the result of covering the broadcast seed.

Rate

The higher the rate of seeding, the greater the number of seedlings and the higher the rating. However, there was a higher percentage of seedlings counted at the lower rates than at the higher. Using 3 lb./acre as 100%, the percentage of seedlings for the other rates at Franklin Basin averaged 86% at 6 pounds, 82% at 12, and 72% at 24. At Logan the percentage was 98% at 6, 95% at 12, and

86% at 24 pounds. The lower percentages from the higher seeding rates were probably not real. This undoubtedly resulted because two or more plants would grow together and be counted as a single plant. This was evident where different species often grew together as a single clump.

Because of lower seedling emergence, higher mortality, and less favorable growing conditions, Franklin Basin required a higher seeding rate than Logan to obtain satisfactory stands. Both areas had good seedbeds, but the annual weeds competed with the young seedlings. At Logan the seedlings were able to grow with the weeds when the soil was moist in April, May and early June. They gradually crowded out the weeds and established a good seeded stand which became thicker each year. At the end of 3 years the 3 lb./acre stand had a fair rating with 6 pounds rating good and 12 and 24 pounds rating excellent. At Franklin Basin snow normally leaves in early June. After the snow leaves, the ground dries out rapidly and the seeded species are unable to compete with such rapidly growing, aggressive annuals as tarweed. Good initial stands are therefore important because thin stands thicken very slowly. At the end of 5 years the stands at Franklin Basin rated fair for 3 and 6 lb./acre, and good for 12 and 24 pounds.

Conclusions

This study indicates that a mixture of wheatgrasses and alfalfa seeded at 3 lb./acre on a good site at a low elevation can be expected to produce a fair stand at the end of 3 years. However, to have a good stand which will control weeds and allow early use, 6 lb./acre of live pure seed should be used. At higher elevations with reduced emergence, higher mortality and a shorter growing season, the rate of seeding a mixture should be increased to 12 lb./acre to get a good stand within reasonable length of time.

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