

# Species for Seeding Arid Rangeland in Southern Idaho

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**Highlight:** *Ninety species were seeded in 2,450 range plots in 60 studies on depleted rangelands and on abandoned dry farmland in the sagebrush region in southern Idaho. Seedings range from 20 to 40 years old. Crested and fairway wheatgrasses were the most successful species on the drier sagebrush sites, and intermediate and pubescent wheatgrasses on the moister sites. Russian wildrye was good in southeastern Idaho, especially on saline lands. Western and Siberian wheatgrasses had some good stands but were not consistently successful. Good seedbed preparation and control of competing vegetation are necessary to get good stands of seeded species. Good seeded stands produced from 800 to 1,800 lb herbage per acre, as compared to 45 to 200 lb before seeding.*

The first range seedings in the sagebrush region in southern Idaho were made in 1932 (Wood, 1936; Hull and Klomp, 1966). These and later seedings opened the way for increased forage yields on depleted ranges and on abandoned dry farm lands. To determine plants useful for seeding these low-producing lands, many species were

tested in several thousand experimental plots and also on large range areas. Based on early seedings, many species have been recommended for seeding certain rangelands in southern Idaho.

This is a report of 60 seedings, some of which were begun in the 1930's, to determine the longevity and value of native and exotic grasses, forbs, and shrubs for seeding southern Idaho ranges.

## Experimental Areas

All 60 seedings were made on depleted sagebrush ranges on the Snake River Plains or in adjacent valleys (Fig. 1). In elevation, seedings range from 2,300 ft in southwestern Idaho up to 6,200 ft in eastern Idaho. Annual precipitation on the seeded sites ranges from below 8 inches in the lower valleys to over 18 inches at the higher elevations. Almost half of the seeding sites received 10 inches or less annual rainfall.

All seedings are in the sagebrush

region. Sagebrush on sites on the upper Snake River Plains is mainly threetip sagebrush (*Artemisia tripartita*). Sagebrush on the other sites is some form of big sagebrush (*A. tridentata*), except that three studies south of Malta are on a shadscale (*Atriplex confertifolia*) site.

Soils on the seeding sites are good for range seedings. Most soils are light to dark brown and range in texture from silt loams to sandy loams. The soil on the shadscale site at Malta is a loam, but has 0.08% salt and a pH of 8.5. Salt and the low rainfall make this site unfavorable for most seeded species.

## Procedures

Ninety of the more promising species tested in range plant nurseries were seeded on 2,450 plots in 60 range seedings. There were 3 to 50 species in each seeding, usually with two plots of each species, though the number of plots varied from 1 to 10. On many sites there were additional plots of crested wheatgrass to determine the best seeding methods for this species. Seedings commenced in 1933 and range from 20 to 40 years old.

We tried to seed experimental seedings similar to large range seedings, and some were seeded in connection with range seedings. Seedbeds varied with site conditions. Thirty-seven seedings were in plowed or burned sagebrush, 18 in burned or plowed cheatgrass (*Bromus tectorum*), three in plowed shadscale, and

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This paper is a joint contribution from Agr. Res. Serv. and Forest Service, U.S. Dep. Agr., and the Idaho and Utah Agricultural Experiment Stations at Moscow, Idaho, and Logan, Utah (Utah Agr. Exp. Sta. J. Paper 1750).

Most of the seedings reported here were made by or in cooperation with ranchers, Bureau of Land Management, and the U.S. Forest Service (Agr. Res. Serv. now responsible for experimental range seeding for domestic livestock). The author thanks cooperating agencies and individuals who helped with field work or made helpful comments on this paper.

Manuscript received June 29, 1973.

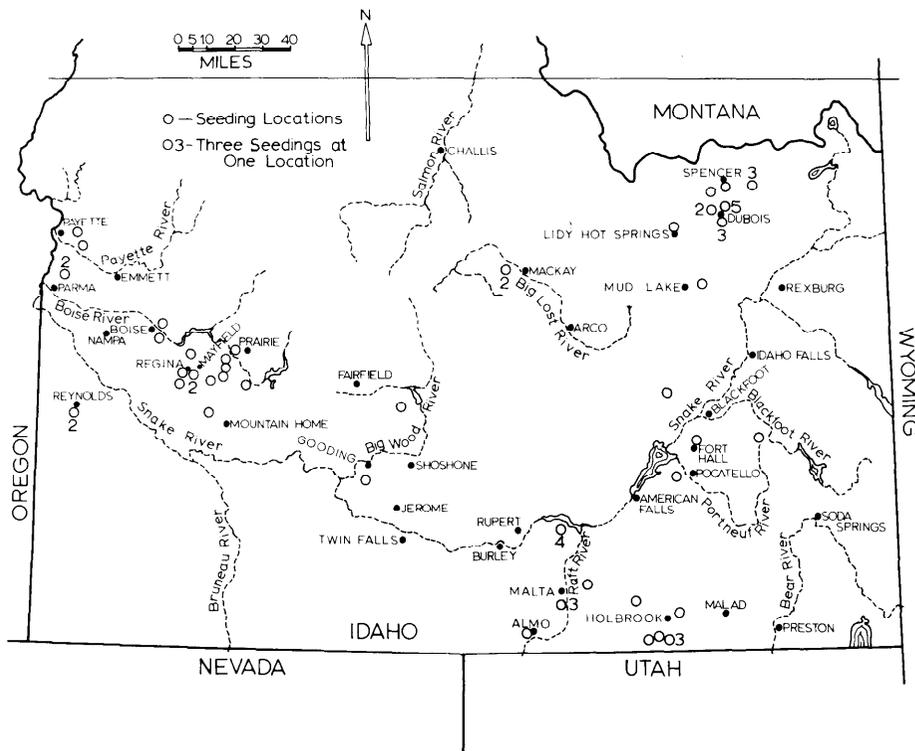


Fig. 1. Location of seedings on sagebrush range in southern Idaho.

two in grain stubble. Seedbed preparation was classed as good on 44 seedings, fair on eight, and poor on eight. A good seedbed had firm soil and little competing vegetation. A poor seedbed had much competing vegetation.

On most studies, a single-disk drill was used to drill seed in 12-inch rows. Seeding depth averaged 0.7 inch, but small seeds were not covered so deeply and larger seeds, such as bitterbrush (*Purshia tridentata*) and Indian ricegrass (*Oryzopsis hymenoides*), were seeded 1.5 inch deep. Where possible, we cut drill furrows from 1.5 to 3 inches deep and covered seeds to the desired depth in the bottom of these furrows. Most seedings were made in the fall.

We planted 25 viable seeds per foot of row, but increased the rate 50% for species having 500,000 seeds per pound and doubled the rate for species having 1 million seeds. This was about 6 lb/acre of good seed for crested wheatgrass, and rates for other species according to their seed size. Legume seeds were inoculated with the proper nitrogen-fixing bacteria before seeding.

After plants were well established, most seedings were grazed. Twenty were grazed very heavily, 24 moderately, and 16 were not grazed.

After seedling emergence, the seedling stands were rated for their success. Ratings were made once or twice a year until the stand was established and then at irregular intervals until 1972, when all

stands were rated. Ratings were from 0 to 10 as follows: 0, failure; 1-2, very poor; 3-4, poor; 5-6, fair; 7-8, very good; 9-10, excellent. Seedling stands were rated for their potential to produce a full stand when mature (Hull, 1954). On many areas, the successful species were clipped for several years to obtain average air-dry yield.

Only a few named varieties were available when these seedings were made. Those showed little superiority and are included with the species.

Many seeded stands contain a mixture of crested and fairway wheatgrasses. Though crested is a tetraploid and fairway a diploid, they are similar, and because of the one basic genome possessed by both, they are considered to be forms of a single polytypic species (Dewey, 1969). Except where noted, both will be called crested wheatgrass.

### Results and Discussion

No matter how poor the seedbed preparation, if the seeds were adequately covered, there were usually good seedling stands of all species. However, seedling mortality was high during the first summer. When annual and perennial plants on the site were not killed during seedbed preparation, they competed with the poorly rooted first-year seedlings for moisture; and seedling death and stand failure were inevitable.

Successful seedings increased herbage production several fold. Excepting cheatgrass, depleted areas had from 45 to 200 lb/acre herbage before seeding. Good seeded stands on these depleted areas have averaged from 800 to 1,800 lb/acre for several years.

We observed that species might do well for 1 to several years and then disappear during dry years or when grazed. Hence, stands less than 20 years of age and that have not been grazed are not considered. Sites vary widely, and a species that fails on one site may succeed just over the hill under better soil or moisture conditions.

Seventeen species seeded on 10 or more plots and having average ratings of 1.0 or above in 1972 are listed in Table 1. Seven species that had ratings of 1.0 to 2.2, but were seeded on fewer than 10 plots, follow:

- Agropyron repens*
- Atriplex canescens*
- Bromus erectus*
- Festuca ovina duriuscula*
- F. rubra*
- Phleum pratense*
- Stipa columbiana*.

Eighteen species with average ratings less than 1.0 were:

- Agropyron riparium*
- A. trachycaulum* (inc. Primar)
- Arrhenatherum elatius*
- Astragalus falcatus*
- A. filipes*
- Elymus cinereus*
- E. glaucus*
- E. salina*
- Festuca idahoensis*
- F. ovina*
- Lupinus leucophyllus*
- Medicago sativa*
- Oryzopsis hymenoides*
- Poa nevadensis*
- Purshia tridentata*
- Sitanion hystrix*
- Stipa comata*
- S. viridula*

Forty-eight of the 90 species failed completely and are not listed.

Crested wheatgrass had the highest success rating and the fewest failures. It withstood heavy grazing and was the best adapted species for the drier sites in the sagebrush region. In nearby experimental seeding studies, there were 555 additional plots of crested wheatgrass, most of which also had good and excellent stands. On the moister sites such as Spencer with 18 inches of precipitation, crested wheat-

**Table 1. Relative rating, number of plots seeded, and percent failures for 17 species with a rating at 1 or above in 1972.**

Species	Relative rating	No. areas seeded	No. plots seeded	Percent failures <sup>a</sup>
<i>Agropyron cristatum</i>	8.3	50	248	2
<i>A. cristatum</i> (rhizomatous no. 8116)	9.5	7	15	0
<i>A. desertorum</i>	7.7	55	231	3
<i>A. dasystachyum</i>	1.7	21	47	67
<i>A. elongatum</i>	1.1	38	77	51
<i>A. inerme</i> (inc. Whitmar)	2.1	39	74	46
<i>A. intermedium</i>	5.1	44	130	19
<i>A. sibiricum</i>	2.3	26	57	23
<i>A. smithii</i>	2.5	25	92	42
<i>A. spicatum</i>	1.0	42	134	71
<i>A. trichophorum</i>	6.2	45	121	10
<i>Balsamorhiza sagittata</i>	1.0	7	17	65
<i>Bromus inermis</i>	2.2	21	84	70
<i>Elymus junceus</i>	3.5	46	98	24
<i>Poa ampla</i>	1.0	35	77	73
<i>P. bulbosa</i>	3.7	31	99	49
<i>P. secunda</i>	1.6	9	14	25

<sup>a</sup>This indicates a complete failure, with no plants on a plot.

grass was outyielded and occasionally replaced with native and other seeded species. Poor stands at Parma resulted from seeding in heavy cheatgrass without cheatgrass control. The only failures of crested wheatgrass were in three seedings in saline soil in the shadscale type south of Malta.

Fairway wheatgrass dries earlier and yields less herbage than crested but is grazed more uniformly and spreads more rapidly by seed. Details on these two grasses are in a recent publication (Hull, 1972).

Intermediate and pubescent wheatgrasses (*Agropyron intermedium* and *A. trichophorum*) were the best-adapted grasses for the more favorable sites in the sagebrush region. Where these two grasses were adapted, the stands thickened to a good sod, and plants spread by rhizomes and seed to adjacent areas. Intermediate and pubescent wheatgrasses are undoubtedly forms of a single species. The pubescent form grows on drier sites and withstands heavy grazing better than the intermediate form. The Topar strain of pubescent was used on 43 of the 121 plots seeded to this grass. It was especially drought-resistant and aggressive. It rated 6.8 as compared to 5.9 for the standard. The Greenar strain of intermediate was used on 14 of the 130 plots of this species. This strain and the standard both rated 5.1.

Intermediate and pubescent wheatgrasses did best where the annual precipitation was more than 13 inches for intermediate and 11 inches for pubescent. Below these precipitation limits, yields were usually low, though there were some high-yielding stands on above-average

sites and where there was little grazing. On drier sites, stands gradually became poorer, especially under grazing. Rupert, with only 9.7 inches of precipitation, is an example of stand deterioration. The Rupert area was seeded in 1945, and since 1954, wire cages have been used to protect the plots that were clipped for yields. Even the protected stands have decreased so that 27-year-old intermediate wheatgrass is producing now less than 100 lb/acre and pubescent less than 200. Under light to moderate grazing, both grasses have almost disappeared.

Russian wildrye (*Elymus junceus*) had many fair to excellent stands and no failures on dry sites in southeastern and south central Idaho. It sometimes produced better stands and yielded more than crested wheatgrass, especially on saline soils. However, in southwestern Idaho, this species had poor stands, and there were many failures. Poor late-spring and early-summer moisture is probably a major reason for the poor showing of Russian wildrye in that area. Russian wildrye withstands heavy grazing and it maintains a good palatability and nutrient content when dry.

Bulbous bluegrass (*Poa bulbosa*) had fair to excellent stands with no failures in southwestern Idaho, but in southeastern Idaho, many plots of this species failed. This grass is a good understory species, and good stands may be obtained by broadcasting, without other treatment. It produces early green feed, but dries up early, and production is low. Also, bulbous bluegrass is highly competitive, and it is hard to get higher-yielding species established on areas that have a good

stand of this plant. For these reasons this grass is not recommended where it is possible to seed higher-yielding species.

Western and siberian wheatgrasses (*Agropyron smithii* and *A. sibiricum*) had some fair to excellent stands, but results were not consistent, and there were many failures. Both species withstood heavy grazing. Siberian wheatgrass is part of the crested wheatgrass complex (Dewey, 1969). The only area where siberian wheatgrass excelled crested wheatgrass was in the dry, sandy loam soil at Wendell. The P-27 strain of siberian was used on 20 of the 57 plots in this study and rated 2.6, compared to 2.2 for the regular form. Other studies show this strain to be useful for seeding the drier sites in southern Idaho (Hafenrichter et al., 1968; Harris et al., 1972).

Bluebunch and beardless bluebunch wheatgrasses (*Agropyron spicatum* and *A. inerme*) are forms of a single species. Both had poor stands, with many failures on the drier sites. On the better sites, there were some fair to good stands, especially in southwestern Idaho. Heavy grazing killed these species on some of the plots. The Whitmar form of beardless blue-bunch wheatgrass was seeded on 49 of the 74 plots of this species. Whitmar stands rated 2.3, compared to 1.8 for the standard.

Smooth brome (*Bromus inermis*) had some good to excellent stands on favorable sagebrush lands where the annual precipitation was more than 18 inches. Though it often grew on drier sites, its production was low.

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