Methods for Seeding Three Perennial Wheatgrasses on Cheatgrass Ranges in Southern Idaho[1]

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Highlight

Sixteen methods of seedbed preparation and seeding three wheatgrasses in dense stands of cheatgrass were tested from 1 to 3 years (1961–62, 1963–64, 1964–65) on an 8.5-inch rainfall area near Wendell, Idaho. Averaging all years, deep furrow drilling in the fall gave the best stands, followed by fall cultivation and drilling and then by summer fallow and drilling. Herbicidal treatment followed by drilling was good the first year but was not consistent. Seeding success was in direct relation to the kill of cheatgrass.

Cheatgrass (*Bromus tectorum* L.), an introduced winter annual, is well adapted to Southern Idaho and surrounding areas. Stewart and Hull (1948) estimate that in Southern Idaho, cheatgrass is the dominant species on 4 million acres; is the principal herbaceous species on another 2 million acres; and is part of the cover on from 10 to 15 million additional acres. Cheatgrass also occurs on large areas in other states (Hulbert, 1955). Hull and Pechanec (1947) estimate cheatgrass in Southern Idaho provides over one half the forage on spring ranges and considering volume of herbage and area covered, it is the most important forage plant in Southern Idaho. Murray and Klemmedson (1968) state that cattle gained weight satisfactorily on cheatgrass range in Southern Idaho.

Despite large acreages, aggressive growth, and good forage production, cheatgrass has many undesirable characteristics. Major ones are: early drying, high fire hazard, short green-feed season, variable production, is often replaced by weedy plants which are hosts of the beet leafhopper, and susceptibility to replacement by medusahead (*Taeniatherum asperum* (Simonkai) Nevski). Because of these undesirable characteristics, the value of rangelands would be improved if a desirable perennial grass cover could be established in place of cheatgrass.

Attempts at seeding perennial forage grasses on cheatgrass areas have often resulted in failures, mainly because of competition between seedlings and cheatgrass plants during the first growing season. In the greenhouse, cheatgrass roots elongated more rapidly and occupied the soil mass more completely than did crested wheatgrass (*Agropyron desertorum* (Fisch.) Schult.) roots. In addition, cheatgrass growing with crested wheatgrass reduced both top and root growth markedly as compared to wheatgrass grown without cheatgrass (Rummell, 1946; Evans, 1961; Hull, 1963; Harris, 1967).

Burning, plowing, disking, mowing, and other cultural methods have not consistently reduced cheatgrass competition sufficient for successful seeding. Furthermore, many of these methods are limited by factors such as steep slopes, rocks, and high cost (Hull and Pechanec, 1947; Hull and Stewart, 1948; Stewart and Hull, 1949; Klemmedson and Smith, 1964).

Many herbicides have successfully controlled cheatgrass and have been used to prepare cheatgrass areas for seeding of perennial grasses (Eckert and Evans, 1967; Evans et al., 1969). Herbicidal control is not universally successful, however, and because of the possible damage to animals, desirable plants, or the environment, alternate control methods should be investigated.

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Procedures

Experimental seedings were made 5 miles north of Wendell, Idaho at an elevation of 3,500 feet. The soil is a Portneuf sandy loam. Annual precipitation averages 8.5 inches with 2.5 inches falling during the spring (March–May), .9 inch during the summer, and 5.1 inches during the fall and winter. Previous vegetation on the area was big sagebrush (*Artemisia tridentata* Nutt.) with a perennial grass and forb understory. All-season grazing and repeated fire depleted the original vegetation which was then replaced by annuals of which cheatgrass was the dominant species. In some years considerable Russian thistle (*Salsola kali tenuifolia* Tausch.), tumblemustard (*Sisymbrium altissimum* L.), and tansy mustard (*Descurainia* spp.) grows. Scattered plants of Sandberg bluegrass (*Poa sandbergii* Vasey) occur.

We tested sixteen methods of preparing the seedbed and drilling the seed; six during each of three years, two for two consecutive years, and eight in one year only (Table 1). There were three replications of each treatment. Each plot was 9 × 25 feet, within which were three rows each of crested, fairway (*Agropyron cristatum* (L.) Gaertn.), and Siberian wheatgrasses (*A. sibiricum* (Willd.) Beauv.), except that seed labeled fairway wheatgrass and used for the first and third years proved to be crested wheatgrass. Seeds were planted with a coneseeder type hand drill in rows spaced 12 inches apart at 6 lb./acre. Seed was covered from 0.5 to 1 inch deep.

Seedings were made either in the fall before or after cheatgrass germination or in early spring. Fall moisture, sufficient to germinate cheatgrass, was accompanied by frost and snow in the first and third years, hence, late fall seedings were not made.

Seedlings were counted during the first growing season and surviving plants during 1967. Ratings on a 100 to 0 basis, with 100 being a full stand of grass, were made during the first growing season and during 1965, 1967, 1968, 1969 and 1970. Yields were taken on some plots in 1970. Tukey's test was used to compare ratings of treatments.

We also tested four of the methods near Glenns Ferry during 1961. Soil, vegetation, and precipitation at Glenns Ferry and at Wendell are similar. The elevation is slightly lower, approximately 3,000 ft. Plots were 50 × 50 feet with two replicates of each treatment. All seedings were made in October.

Table 1. Average 1970 ratings of wheatgrass stands from seedings made by different methods over a 3-year period (1961–62, 1963–64, 1964–65). Ratings are 0 to 100, with 100 being a full stand of grass.

Cheatgrass treatment and method of seeding[a]	1961–2	1963–4	1964–5
Wendell			
Spray 2,3,6-TBA spring, drill fall	87[b]	30	10
Spray 2,3,6-TBA spring, drill spring	—	—	10
Spray Paraquat spring, drill spring	—	—	23
Burn summer, drill fall	10	10	37
Summer fallow, drill fall	13	67	60
Summer fallow, drill next spring	—	10	50
Drill fall, before cheatgrass germination	10	10	—
Drill fall, after cheatgrass germination	—	10	—
Deep furrow drill, before fall germination	30	40	93
Deep furrow drill, after fall germination	—	100	—
Cultivate spring, drill fall	20	20	50
Cultivate and drill before fall germination	16	53	80
Cultivate and drill after fall germination	—	53	—
Cultivate after fall germination, drill spring	—	10	—
Cultivate spring, add barnyard manure, drill fall	91	—	—
Cultivate spring, add N and P, drill fall	—	—	23
Glenns Ferry			
Spray 2,3,6-TBA spring, drill fall	75	—	—
Burn summer, drill fall	25	—	—
Cultivate spring, drill fall	15	—	—
Cultivate and drill before fall germination	30	—	—

[a] Herbicides are 2,3,6-trichlorobenzoic acid (2,3,6-TBA) and 1,1-dimethyl-4-bipyridinium salt (paraquat).

[b] Within each year any 2 means which differ more than 25 are significantly different at the 5% level.

Results and Discussion

Emergence was good on both spring and fall seedings in all years. However, where seeded plots had medium to dense stands of cheatgrass during the first growing season, soil moisture was rapidly depleted and most wheatgrass plants soon dried up and died. Where treatments reduced cheatgrass to 12 or less plants/ft^2, there was less competition and many wheatgrass plants survived. The second growing season, surviving wheatgrass plants were vigorous and formed good stands. In general, seeding success was in direct relation to the kill of cheatgrass.

Species

All three wheatgrasses were seeded in each of the 12 methods in the second year. Average ratings of the second year stands were 33 for Siberian wheatgrass, 30 for fairway wheatgrass, and 28 for crested wheatgrass. As the three wheatgrasses were similar in stand establishment, they are combined for methods comparisons. To show relative productivity of the three wheatgrasses we sampled stands in which the grass rated 100 and 50. Air-dry yields (lb./acre) in these stands averaged as follows:

Species	100 rating	50 rating
Siberian wheatgrass	1767	1013
Crested wheatgrass	1630	1020
Fairway wheatgrass	1207	884

Year of Seeding

Results were not consistent among the 3 years. Averaging the six methods tested in all 3 years, 1964–65 had the best stands, followed by 1963–64

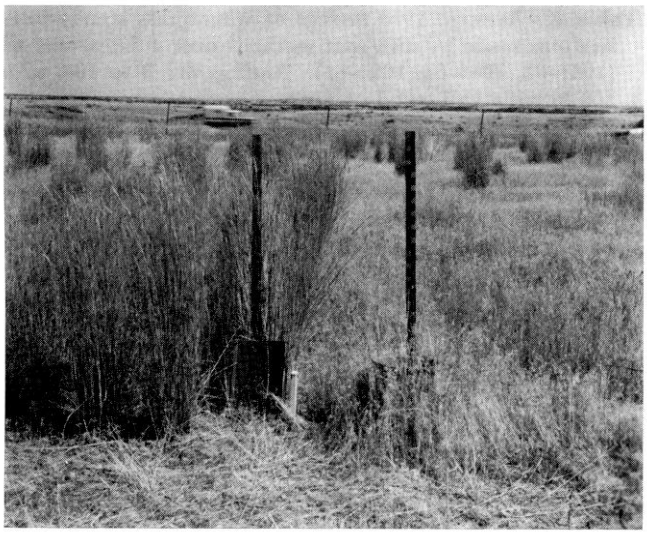

FIG. 1. Plot at left seeded with a deep furrow drill after cheatgrass germination in the fall of 1963. Cheatgrass with no treatment on right. Photograph taken September 1971.

and 1961–62. Using the water year, October 1 to September 30, 1964–65 had 13.7 inches of precipitation. Late fall and winter precipitation was especially good. Though 1963–64 had only 7.6 inches, November had over 2 inches, while April, May and June had over 3 inches of well spaced and effective rain. Thus both years had good seedling emergence and survival.

Season of Seeding

When directly compared, fall seeding was superior to spring seeding. Fall is the recommended season for seeding in these low rainfall areas, even when cheatgrass does not germinate in the fall.

Method of Seeding

Averaging all years, deep furrow drilling gave the best results and is recommended for seeding cheatgrass areas (Fig. 1). This was followed by fall cultivation and drilling and then by summer fallow and shallow drilling in the fall (Table 1). Spraying with herbicides was successful in only 1 year, 1961. More recently, herbicidal control followed by deep furrow drilling, has given good seeded stands (Eckert and Evans, 1967). Burning was done so late in the season that it gave poor control of cheatgrass (Hull and Stewart, 1948). Results at Glenns Ferry were similar to 1961 results at Wendell where spraying with herbicides gave the best seeded stands (Table 1).

Fall Emergence of Cheatgrass

Successful fall seeding is dependent upon good fall germination and kill of newly-emerged cheatgrass. Hull and Pechanec (1947) state that fall germination, emergence, and good subsequent growth of cheatgrass averages once every 8 years in Southwestern Idaho. Good fall growth occurred once during this study. In 1963, over 2 inches of rain fell in early November. Warm weather with good cheatgrass emergence followed. Fall cultivation after emergence gave good cheatgrass kills and good seeded stands resulted. In the first and third years, 1961 and 1964, cheatgrass did not emerge early enough in the fall to treat following emergence.

Conclusions

This study indicates that good stands of seeded grass may be obtained on ranges dominated by cheatgrass, but that cheatgrass must be controlled. For good seeded stands, we must consider methods and time of cheatgrass control, especially the effectiveness of the various methods at each stage of cheatgrass plant development. Seeded stands were successful when cheatgrass was reduced to 12 plants/ft^2 during the first growing season. Fall control of cheatgrass and seeding should be done only in those years in which there is early and near complete fall germination of cheatgrass.

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