A Comparison of Crested Wheatgrass and Native Grass Mixtures Seeded on Rangeland In Eastern Montana

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During the period 1936 to 1942, about 75,000 acres of formerly cultivated land in Prairie County, Montana was reseeded to grass. Most of this seeding was done under the Land Utilization Program of the U. S. Department of Agriculture.

Crested wheatgrass *(Agropyron desertorum)* was most used in the program because seed was plentiful, the species was adapted to the climate and soils, and persistent stands were readily established. At that time crested wheatgrass filled the need for grazing, hay, and erosion control.

Native grasses were included with crested wheatgrass in a few plantings. These included green needlegrass *(Stipa viridula)*, Sandberg bluegrass *(Poa secunda)*, western wheatgrass *(A. smithii)*, and blue grama *(Bouteloua gracilis)*. Mixtures of native species and crested wheatgrass were planted at the same time and in the same pasture units. These plantings under the same conditions of seeding, establishment and grazing use provided an excellent opportunity for study.

Other workers have reported on the use of crested wheatgrass for reseeding abandoned cropland and depleted ranges. Heinrichs and Bolton (1950) re-

ported good establishment of crested wheatgrass on depleted rangeland in Saskatchewan. Houston (1957) found that crested wheatgrass seeded on depleted native range increased herbage production over unseeded range when both were protected from grazing. Hubbard (1949) reported that crested wheatgrass seeded into sod was not successful unless the sod was seriously depleted by overgrazing or cultivation. Little information has been published on the comparative values of native and introduced grasses used for reseeding in the northern plains.

The Study

The study area was located about twelve miles southwest of Terry, Montana on a high bench overlooking the Yellowstone valley. Seedings made in April in 1940 were studied in 1957. The soils were medium depth sandy loams, susceptible to erosion but with fair water holding capacity. The average annual precipitation is between 12 and 13 inches. In 1957 precipitation was 13.66 inches with 10.7 inches coming during the growing season, April 1 to September 1.

All data on seedings of crested wheatgrass and native mixtures were obtained from adjacent seeding within the same pasture (Figure 1).

Insofar as grazing was managed by pasture units the two types of seedings received the same treatment. It cannot be said that the two types of seedings in one pasture were grazed equally, however, because crested wheatgrass was preferred in spring and some of the native species in summer. Therefore, data from the two pasture units represent different seasons of use. The "community" pasture used in common by several operators, was regularly grazed by cattle from April 15 to December 15. The "individual" pasture used by a single operator was grazed by cattle each May and again lightly in winter. The degree of use had ordinarily been moderate on the "community" pasture and light to moderate on the "individual" pasture. Both pastures included native and seeded areas.

The grasses were seeded into an annual weed cover on formerly cultivated land with a semi-deep furrow drill in 20 inch rows. Russian thistle *(Salsola kali)* was the dominant weed. The mixture included one pound each of crested wheatgrass, western wheatgrass and green needle grass and one half pound each of blue grama and sandberg bluegrass per acre. Crested wheatgrass was seeded at four pounds per acre.

In the "individual" pasture 24 foot strips of the mixture were alternated with strips of crested wheatgrass. In the "community" pasture a block of approximately 40 acres was seeded to crested wheatgrass and an adjoining block of approximately 30 acres was seeded to the mixture. Other crested wheatgrass areas were scattered throughout the "community" pasture. Herbage yield from the mixture and crested wheatgrass plantings in the "community" pasture and from adjoining strips of each in the "individual" pasture was determined.

Procedure

Five 9.6 sq. ft. circular plots were selected at random in each of the four conditions studied. In the "individual" pasture the plots on the two types of plantings were on strips immediately adjacent to each other (Figure 1).

Herbage was clipped by hand approximately 1 inch above the ground. It was separated by species, air dried and weighed in grams then converted to pounds per acre. The few forbs present were grouped regardless of species. Skeleton weed *(Lygodesmia juncea)*, toadflax *(Linaria vulgaris)*, green sagewort *(Artemisia glauca)*, salsify *(Tragopogon pratensis)*, and woolly plantain *(Plantago*

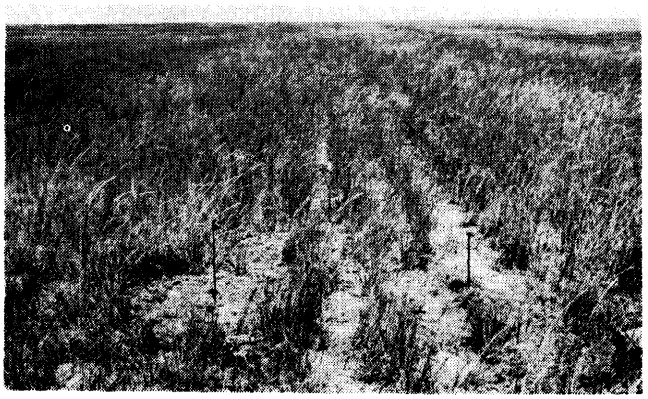

FIGURE 1. One set of plots after clipping in the "individual" pasture where strip seeding was used. Plot on the right is in crested wheatgrass. The one on the left is in the mixture.

FIGURE 3. Gully crossing a crested wheatgrass strip in the "individual" pasture: Mixture strip in the background and the edge of another mixture strip in the foreground.

purshii) made up this group.

Results

Crested wheatgrass areas in the "community" pasture yielded 942 pounds of herbage per acre. Of this, 783 pounds were crested wheatgrass, 103 pounds sand dropseed *(Sporobolus cryptandrus)* and 56 pounds other species that volunteered (Table 1).

Mixture plantings in the "community" pasture yielded 1,508 pounds of herbage per acre. Green needlegrass produced 422 pounds, western wheatgrass 198 pounds and crested wheatgrass 165 pounds. Needle-and-thread *(Stipa comata)* which had invaded the planting accounted for 581 pounds of the herbage (Table 1).

In the "individual" pasture the crested wheatgrass strips yielded 1,168 pounds of herbage per acre. Of this, 1,008 pounds were crested wheatgrass, 113 pounds green needlegrass which had invaded from the adjoining strip and several other volunteer species made up the remaining 47 pounds (Table 1).

The mixture strips in the "individual" pasture produced 1,642 pounds of herbage per acre. Of this, 1,017 pounds were green needlegrass, 235 pounds western wheatgrass and 291 pounds crested wheatgrass. Several other species of minor amounts made up the balance, 99 pounds (Table 1).

The mixture provided considerably better ground cover and protection against soil and water losses (Figure 2). These values were well demonstrated on one of the steeper slopes in the strip seeded area where a gully two feet wide and eight inches deep had developed across the strip of crested wheatgrass. It feathered out and disappeared on the mixture strip only to start up again in the next crested wheatgrass strip (Figure 3). The gully continued in this fashion to the base of the slope with rather severe erosion on the crested wheatgrass strips and little or none in the native mixture strips. Individual crested wheatgrass plants were hummocked an average of 2 to 3 inches whereas the mixture plantings showed no appreciable erosion.

Table 1. Herbage production, 1957, on areas seeded in 1940 to crested wheatgrass and a mixture of native grasses.

Species	Individual pasture		Community pasture	
	Crested wheatgrass area	Mixture area	Crested wheatgrass area	Mixture area
	(Pounds per acre[1])			
Crested wheatgrass	1,008.	291	783	165
Green needlegrass	113	1,017	0	422
Western wheatgrass	T	235	0	198
Needleandthread	0	9	20	581
Sand dropseed	0	2	130	55
Blue grama	32	22	23	60
Forbs	14	67	13	30
Total yield	1,168	1,642	942	1,508

[1] Each value is based on average yield from five plots.

Discussion

Under spring and winter grazing in the "individual" pasture green needlegrass increased and invaded the adjoining crested wheatgrass strips. With continuous season long use in the "community" pasture the mixture planting was invaded by needle-and-thread from the surrounding native range. Under continuous use the crested wheatgrass maintained almost a pure stand with no encroachment by green needlegrass and only a minor amount of needle-and-thread and sand dropseed. This was partially due to the fact that these were block plantings rather than strip plantings as in the "individual" pasture. This somewhat isolated the crested wheatgrass from an immediate seed source of the native species. Hubbard (1949) reported that heavy spring grazing of old crested wheatgrass fields

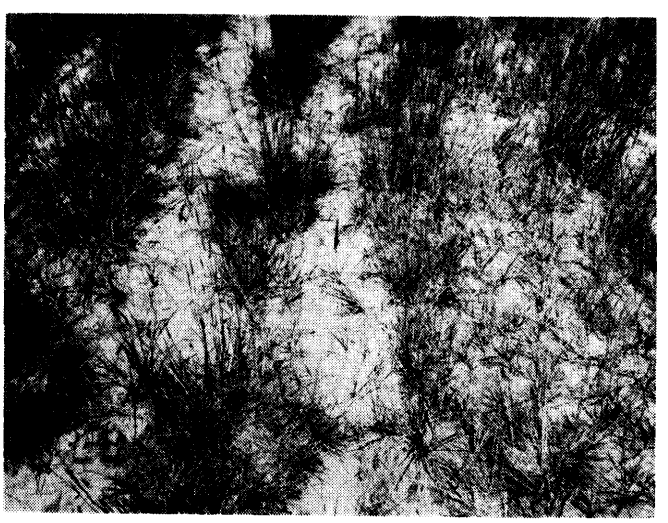

FIGURE 2. The mixture (right) provided better ground cover and more effective control of erosion than crested wheatgrass (left). Some western wheatgrass and green needlegrass have invaded the crested wheatgrass strip.

resulted in invasion by other grasses if seed source was readily available. The crested wheatgrass in the "community" pasture produced the lowest herbage yield, the least ground cover and left the soil most susceptible to erosion.

The blue grama seeded in these plantings made a very poor showing. Surviving plants had very poor vigor and many of the clumps were half dead. Blue grama is a natural constituent of the range in this area and its performance in the seedings was much poorer than expected. It is suspected that the poor performance was due to the use of unadapted seed from a southern source.

Practically no Sandberg bluegrass was left in any of the plots. It is regrettable these plantings were not studied earlier. As it is, no information is available on stand establishment, composition and yield of the plantings when they were young.

Summary

In 1940 plantings of crested wheatgrass and mixtures of native species were made on formerly cultivated land in Prairie County, Montana. Green needlegrass and western wheatgrass were the dominant native species used in the mixtures. These plantings have been grazed since 1942. A study of the plantings 17 years after seeding brought out these points:

1. Herbage yield by the native mixture was 58 percent greater than for crested wheatgrass in a pasture grazed April 15 to December 15 annually for 16 years.
2. Herbage yield of the native mixture was 36 percent greater than for crested wheatgrass in the pasture used for spring and winter grazing.
3. The native mixture controlled erosion considerably better than the crested wheatgrass.
4. Continuous use April to December permitted an increase of needle-and-thread grass in the mixture seeded area and a reduction in the vigor and yield of the crested wheatgrass.
5. With spring and winter grazing, green needlegrass increased and encroached on the adjoining crested wheatgrass strips.
6. For long time production and erosion control under the conditions studied, mixtures of native species are better for range reseeding than crested wheatgrass alone.

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