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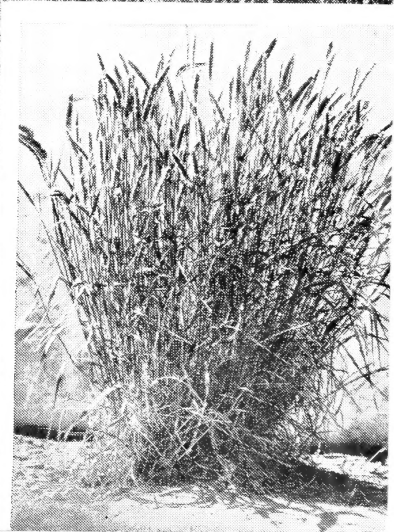
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# Crested Wheatgrass

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U. S. DEPARTMENT OF AGRICULTURE

# CRESTED WHEATGRASS

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## Introduction Into the United States

Crested wheatgrass (*Agropyron cristatum* Gaertn.) is a hardy, drought-resistant perennial bunch grass, native to the cold, dry plains of Russia and Siberia. The first recorded introduction into the United States was made through the efforts of the United States Department of Agriculture in 1898, but the possibilities of the grass did not attract much attention until after 1915, when it was sown in the northern Great Plains, where it proved especially adapted.

## Description and Characteristics

Crested wheatgrass is closely related botanically to slender wheatgrass (*A. pauciflorum* (Schwein.) Hitchc.) and bluestem, or western wheatgrass (*A. smithii* Rydb.), both native to the northern Great Plains. It is a typical bunch grass, differing in this respect from western wheatgrass and brome grass (*Bromus inermis* Leyss.), both of which spread by underground rootstocks and tend to develop a uniform turf.

Two distinct strains of crested wheatgrass, the Standard and the Fairway, are grown commercially at the present time. The taller Standard strain is the more generally planted in the United States and is represented by a wide range of types. Some plants are leafy and fine-stemmed, whereas others produce few leaves and have stiff and coarse stems. Head types are extremely variable, some being lax and others dense. The seeds of some plants have pronounced awns, whereas those of others are awnless or nearly so. Strains now in process of development have extremely plump, awnless seeds with a test weight of over 30 pounds per bushel. Seeds with long awns are objectionable, as they have a tendency to hang together and do not feed readily through the drill. The seedlings of the Fairway strain are smaller than those of the Standard strain, and the plants are lower growing and slightly more leafy. The seed is also smaller and has pronounced awns. The Fairway strain has been used to some extent as a dry-land lawn grass, but it has a tendency to become bunchy as the plants become older. In western Canada, where the Fairway strain was developed, it is used for all purposes more generally than is the Standard strain.

Crested wheatgrass has a longer productive life than slender wheatgrass or brome grass and under northern Plains conditions has yielded well for 15 to 20 years or more. In comparable tests brome-

<sup>1</sup>The writers are indebted to members of the staff of the Division of Dry Land Agriculture as follows: J. T. Sarvis, Mandan, N. Dak., Leroy Moomaw, Dickinson, N. Dak., M. A. Bell, Woodward, Okla. (formerly of Havre, Mont.), and R. M. Williams, Moccasin, Mont., for suggestions in the preparation of this leaflet.

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grass and slender wheatgrass have frequently yielded more than crested wheatgrass the first 2 or 3 years, after which the slender wheatgrass tends to die out and the brome grass becomes sod-bound, whereas the crested wheatgrass continues to produce satisfactorily even under limited moisture conditions. At the Northern Great Plains Field Station, Mandan, N. Dak., a seeding made in rows in 1915 returned its sixth highest hay yield in 1935, the twentieth year of production. This planting has produced 25 consecutive crops. The highest yield was 3,550 pounds per acre, in 1916, and the lowest was 146 pounds per acre, produced during the severe drought of 1936. The average yield for the 25 years has been 1,675 pounds per acre.

Crested wheatgrass is able to grow at low temperatures and as a result makes earlier and more rapid growth than most other grasses

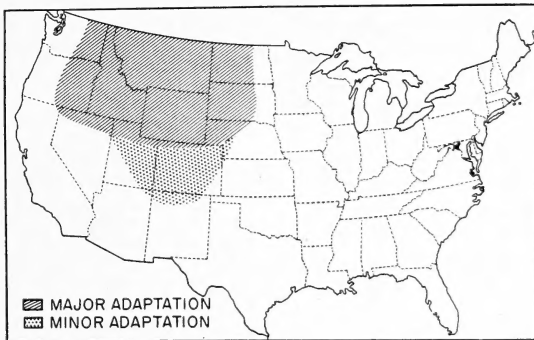


FIGURE 1.—Adaptation of crested wheatgrass.

with which it has been compared. The grass is extremely drought resistant and has survived the most severe periods of dry weather. This characteristic is probably due to its extensive root system, which permits storage of abundant food reserves and ready utilization of water. Excavations have shown that the roots may penetrate to a depth of 8 to 10 feet. During hot, dry periods the grass has the ability to become more or less dormant and protects itself from injury by this characteristic. With a favorable moisture supply, growth is resumed upon arrival of the cool days of autumn and continues until late in the season. Its ability to grow at low temperatures combined with its efficient utilization of soil moisture enables the grass to crowd out weeds where the moisture supply is limited. It is entirely resistant to all extremes of cold. No reports of killing of an established stand from either cold or drought have been made in areas where the grass is adapted.

### Adaptation

Crested wheatgrass is especially well adapted to the northern Great Plains, where the temperatures are severe and the moisture supply is limited, and westward to the Sierra Nevada Mountains (fig. 1). In this general region it has proved particularly valuable for regrassing abandoned croplands. Farther south it has not given as good results except at altitudes of 5,000 feet or more. In the area adjacent to the Plains on the east, other grasses are generally more satisfactory.

Under the more favorable moisture conditions of the Eastern States it is not equal to timothy and other adapted grasses.

The grass does well on productive soils of almost any texture ranging from light sandy loam to heavy clay. It has done well on stony loams in the Judith Basin, Mont.

### Seeding

Crested wheatgrass, in common with many other grasses, is tender in the seedling stage and requires favorable conditions for germination and early growth. A firm seedbed is essential to establishing a satisfactory stand. Grass seedlings are readily susceptible to soil blowing. A protective cover should be established on soil that is likely to blow before seeding is undertaken. The general practice considered safest to avoid danger from soil blowing is to drill the seed directly into grain stubble, without previous tillage. Stubbleland provides a firm seedbed and makes possible seeding of large areas that otherwise could not be returned to grass because of expense involved or danger from soil blowing.

The most favorable time to sow crested wheatgrass varies with the locality, the moisture supply, and the abundance of grasshoppers. Young crested wheatgrass plants thrive best under cool growing conditions, such as occur during fall or early spring. Seedings made both in fall and spring have been successful in the northern Great Plains. Within recent years fall seeding has met with greater favor and success than seeding at any other period. Early fall seeding can usually be done late in August or during early September, depending upon moisture conditions. Late fall seeding can be done any time from the middle of October until the soil freezes. Early spring seeding should be done as soon as field work can be started. Late spring seeding can be done during May.

The purpose of early fall seeding is to give the grass a chance to make a good fall growth before the soil freezes. Planting at this time is dependent upon rainfall to afford favorable moisture conditions before seeding can be attempted. When such conditions occur, seeding should be done as soon as possible. Clean grain stubble furnishes one of the best preparations for early fall seeding. Drilling the seed under such conditions permits the grass to make considerable growth before winter, and the stubble protects the seedlings from danger of soil blowing and catches snow to furnish moisture for early and rapid spring growth. Well-prepared summer fallow can also be used to advantage as a seedbed, especially for early fall seeding, provided there is little or no danger from soil blowing. Summer fallow is best used for special seedings or for small acreages. The reserve moisture stored in the fallow usually favors more growth and stronger plants than any other preparation. Seedings made in the early fall make growth before winter, much as do winter wheat and rye, start growth early in the spring, and suffer the least competition from weeds. Under favorable conditions such seedings make a crop of seed or hay during the first year.

Late fall seeding is not dependent upon favorable moisture conditions at the time of seeding as the seed is put into the ground late enough so that it will not germinate until early the next spring. Such seedings are less subject to grasshopper damage than early fall or late

spring seedings. Late fall seeding can be extended over a longer period than early fall seeding and is better adapted for planting larger acreages. It is especially well adapted to land that has been damaged by blowing but has a weedy cover. Seedings made at this time usually start growth before it is possible to get into the field in the spring. The seed can be drilled into grain stubble or abandoned land that has a protective cover of weeds. This time and method of seeding has resulted in the regrassing of large acreages in the northern Plains.

Early spring seeding should be done as soon as it is possible to get into the field and can best be done in clean grain stubble or on protected corn ground.

Late spring seeding is usually best practiced where it is desirable or practicable to prepare a seedbed, or to clean up a crop of weeds before seeding. Such seedings may be made during May depending upon the moisture and temperature conditions, and the prevalence of insects, especially grasshoppers. Corn ground that is protected from soil blowing affords a good seedbed. Grain stubble can be plowed and prepared for seeding. Such planting should not be undertaken on soil that is likely to blow. In all cases it is necessary to prepare a firm seedbed, especially if the soil is worked to kill a crop of weeds just before seeding. A good rain just before seeding will usually firm the soil enough for a suitable seedbed. If a rain does not come at the right time, it may be advisable to pack the soil before seeding. Late spring seedings can be made on summer fallow under some conditions, but in some areas weeds are much worse in grass seedings on fallow at this time.

Crested wheatgrass may be sown in close drills or in rows wide enough apart to be cultivated. Where the crop is to be utilized for hay or pasture, close drills are preferable. The seed should be sown with a grain drill and covered about one-half inch. When seeding in the early fall on fallow it may be advisable to plant the seed approximately an inch deep in order to place it in contact with moisture and below the surface layer, which often dries out. A firm seedbed is essential to uniform shallow seeding. A single-disk drill has proved satisfactory for most seedings on a prepared seedbed, especially fallow, as it cuts through trash and leaves the surface of the soil rough. A double-disk drill can be used satisfactorily, if the depth of planting is watched closely and the seedbed is in good condition. A deep furrow disk-type drill (without chains) has been used extensively and successfully, especially for planting abandoned land, where the seedbed is firm and where it is necessary to cut through weedy growth and trash. Broadcasting has not proved satisfactory in most cases.

The use of clean, heavy seed cannot be too strongly emphasized. Good seed should weigh 22 pounds or more to the bushel. Seed of this weight will run freely through a drill without the aid of an agitator. Light, chaffy seed will not feed through the drill readily even with the aid of an agitator.

If grown mainly for seed production, the grass should be sown in rows and kept cleanly cultivated, as more seed of better quality can be produced in rows than in close drills with a limited moisture supply (fig. 2). The seeding may be made in single rows or in double rows. In single rows the seed is dropped from one spout of the grain drill, and in double rows from two adjacent spouts, which are usually 6 or 7 inches apart. The latter method is preferable as skips are less likely

to occur. The most satisfactory distance between rows is 36 to 42 inches for either single or double rows. New row plantings can be marked for early cultivation, by mixing about 10 percent of winter rye (in the fall) or small-seeded oats (in the spring) with the grass seed.

In the northern Great Plains a seeding rate of 5 to 8 pounds per acre of good seed is most satisfactory for solid or close drilling. Where moisture conditions are more favorable, the rate of seeding may be increased to 10 to 12 pounds per acre. Where the moisture supply is limited, a too-heavy stand results in decreased yields. In cases where it is desired to seed a considerable area of abandoned land as cheaply as possible, the seeding rate can be decreased to 3 or 4 pounds per acre although it may take 1 or 2 years longer to establish a good

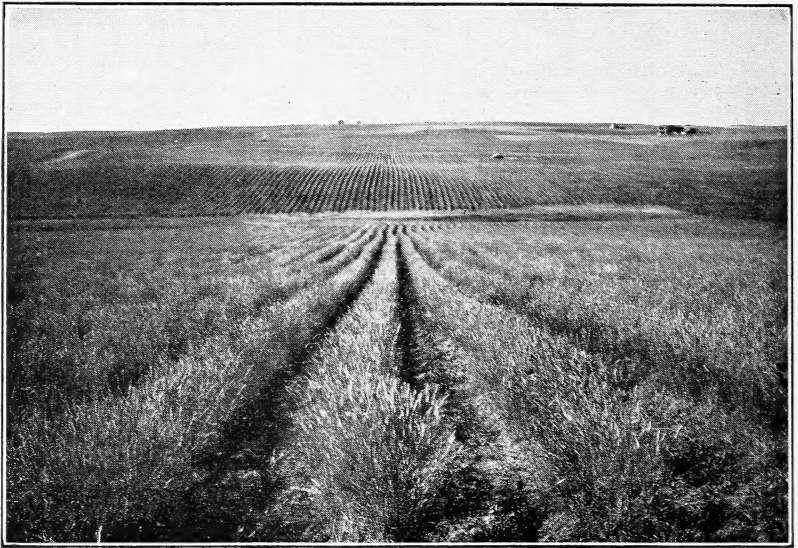


FIGURE 2.—Crested wheatgrass grown in rows for seed production, Dickinson, N. Dak.

stand. If a furrow drill is not available it may be necessary to plug every other cup on the drill to obtain such a light seeding. If allowed to produce a seed crop, thin stands are gradually thickened by the ability of this grass to volunteer. In cultivated rows 1 or 2 pounds of good seed per acre is ample for single rows and 2 or 3 pounds for double rows 36 to 42 inches apart.

Crested wheatgrass should not be seeded with a nurse crop in dry-land areas as the small seedlings cannot stand the competition for moisture.

### Treatment

Ordinarily a close-drilled field of crested wheatgrass does not require any attention during the year that it is sown. In a favorable season a light crop may be produced, but it is usually advisable to permit the grass to stand so that it will make enough top growth to catch snow the first winter and the roots will have an opportunity to build up additional food reserves. This vegetative growth should be



mowed and removed the following spring. It is not advisable to burn the old growth. The seedlings are small and difficult to see; therefore it is advisable to leave a seeded area undisturbed the first season, even though there does not appear to be a satisfactory stand. As a general rule, weeds should not be clipped on a new seeding. After the first year weeds give little trouble in close-drilled fields. Row seedings usually require an early spring cultivation to kill volunteer grass seedlings and to put the soil in a receptive condition for moisture, and one or two cultivations are needed later to destroy weeds.

### Utilization

In the areas to which it is adapted, crested wheatgrass fills a unique place as a pasture grass, and it is probable that its greatest usefulness will be for this purpose. The grass is especially valuable as a supplement to native range. It can be grazed almost a month before native range is ready and at a much heavier rate. When native range is in the best condition for grazing, livestock can be taken off the crested wheatgrass and any grass remaining can be cut for hay. With favorable moisture in the fall enough growth is made so it can again be grazed. Utilization in this manner increases the grazing period considerably and provides succulent feed in the early spring, when it is so important for calving or lambing pastures. Young crested wheatgrass large enough for grazing has a high protein content (20 to 30 percent) both in the spring and in the fall.

If the grass is to furnish a good quality of hay, it is advisable to cut it by the time it comes into head or at least by blooming time. As the grass matures, it becomes harsh, and the protein content decreases rapidly and by the time the grass is mature may be as low as 2 or 3 percent. The hay cures readily, and with favorable weather can be stacked or stored soon after being mowed. Where the grass is adapted, yields have ranged from three-fourths of a ton to 1 ton of cured hay per acre over a period of years, with considerably higher yields in the more favorable seasons.

In grazing tests conducted in cooperation with the Bureau of Dairy Industry at the United States Dry Land Field Station, Ardmore, S. Dak., crested wheatgrass for dairy cows proved superior to brome-grass, sweetclover, and native pasture. At the Judith Basin Branch Station, Moccasin, Mont., crested wheatgrass has given better returns as a dry-land pasture than brome-grass, sweetclover, or native grass, especially in years with less than 12 inches of annual precipitation or other adverse conditions. At Mandan, N. Dak., crested wheatgrass makes excellent early pasture and cattle make good gains on new growth. In common with other cultivated grasses, its grazing value decreases as it approaches maturity.

Crested wheatgrass is the most important grass for use in the crop-replacement program in areas where it is adapted. Many thousands of acres of abandoned plowed lands have been reseeded with excellent results. If mixtures of grasses are used, 50 percent or more of the seed in the mixture should be crested wheatgrass.

The grass can be utilized very effectively for the control of wind and water erosion. The title-page illustration shows the grass (planted 1923) on sloping land for protection against water and wind erosion at the Northern Great Plains Field Station, Mandan, N. Dak. Its tough,

fibrous root system especially adapts it for use in rotations. Because it is a bunch grass, it is easily killed by plowing. The roots add a tremendous amount of organic matter to the soil, which is so important for good crop production, and water infiltration is increased. The sod affords an excellent clean seedbed for flax in areas where that crop is adapted. The grass is also useful for seeding rights-of-way along highways and for farm roadsides where a permanent growth is needed to control coarse weeds.

### Seed Production

Crested wheatgrass has good seed habits. It yields well, matures early, and can be harvested with machinery available on grain farms. As the seed ripens while the plants are still green, the straw is of considerable value for feeding. Because crested wheatgrass seed shatters readily, harvest should begin when the seed reaches the stiff dough stage. Much of the seed may be lost in windy weather, if the grass is allowed to become too mature. A fair average yield of seed when grown in rows is 200 to 300 pounds per acre, and under more favorable conditions 400 to 500 pounds may be obtained. The crop may be cut with a grain binder and should be shocked immediately. Under normal weather conditions, 10 days in the shock is sufficient for drying before threshing. The seed is easily threshed with an ordinary grain separator. To avoid loss of seed in threshing, the speed of the fan should be reduced or the air intake to the fan closed. With some separators it is desirable to lower the rear of the machine so that the seed may pass back to the delivery and the straw be handled more satisfactorily. Under certain conditions best results in threshing are obtained by reducing the speed of the cylinder somewhat, although this is not always necessary or desirable. All, or practically all, of the concaves should be removed.

Crested wheatgrass seed can be cleaned with an ordinary farm fanning mill equipped with the proper sieves. A top sieve having oblong openings of  $\frac{1}{4}$  by  $\frac{1}{18}$  inch and a bottom wire screen with a mesh of 6 by 26 or 4 by 26 will, under most conditions, give the best cleaning results. Larger sieves may be required for a preliminary cleaning if the threshed material contains an undue amount of trash.

A fair standard for crested wheatgrass seed is a bushel weight of at least 22 pounds, a purity of 88 to 90 percent, and a germination of 85 percent. Choice seed will weigh 24 to 26 pounds per bushel.

Anyone desiring further information on crested wheatgrass should write to the nearest State experiment station for details especially applicable to the locality.