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SEEDING CRESTED WHEAT GRASS FOR HAY AND PASTURE

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EXPERIMENTAL FARMS SERVICE



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FOREWORD

This pamphlet deals chiefly with methods of soil preparation and seeding as they affect the "catch" of crested wheat grass when sown for hay or pasture. It has now been fully established that good "catches" of this grass can be obtained in the Prairie Provinces even in the driest years if the grower will follow certain clearly defined principles as outlined in the following pages. The experimental work on which the following recommendations are based has been conducted for several years by T. M. Stevenson at the Dominion Forage Crops Laboratory, University of Saskatchewan, Saskatoon; by Dr. S. E. Clarke at the Dominion Range Experiment Station, Manyberries, Alberta; and by F. M. MacIsaac, at the Dominion Experimental Station, Scott, Sask. This joint contribution, prepared by Dr. Stevenson, in consultation with Dr. Clarke and Mr. MacIsaac, should be carefully studied by those who desire to make a success of growing this crop in areas subject to drought. A companion publication, "Growing Crested Wheat Grass for Seed Production" by T. M. Stevenson and W. J. White, is also available, in which methods of seeding, harvesting, threshing and seed cleaning are considered.

SEEDING CRESTED WHEAT GRASS FOR HAY AND PASTURE

Introduction

Crested wheat grass, due to its remarkable drought resistance, hardiness and longevity, has proved to be of great value for returning fibre to the soil, when used as a hay and pasture crop, and for regrassing range lands in the drier prairie areas of Western Canada. Experiments, conducted over a period of years in the park belt area of Saskatchewan, have demonstrated that the usefulness of this species as a pasture grass is not confined to semi-arid areas only. The fact that it is ready to be pastured one to three weeks earlier in the spring than the native and other cultivated perennial grasses makes it of value as a pasture crop in the more humid sections, as well as in the drier areas. It is valuable in the park belt area when grown in mixture with other grasses and with alfalfa.

In the production of crested wheat grass, as with other perennial crops, the first consideration is the matter of obtaining a satisfactory "stand." Poor "catches" of perennial grass, especially of the non-spreading types, rarely improve to a point where they are satisfactory. It is essential, therefore, in seeding these crops to adopt those practices which are most likely to ensure a uniform and sufficiently dense distribution of plants from the start. The procedure which is most suitable in the drier areas may not give best results in areas more favoured with soil moisture, and vice versa. On the other hand, there are certain requirements, as to time and depth of seeding and firmness of soil, which must be met under all conditions, if a satisfactory stand is to be obtained. These and other factors, having a bearing on the seeding of crested wheat grass, are discussed briefly in the following pages.

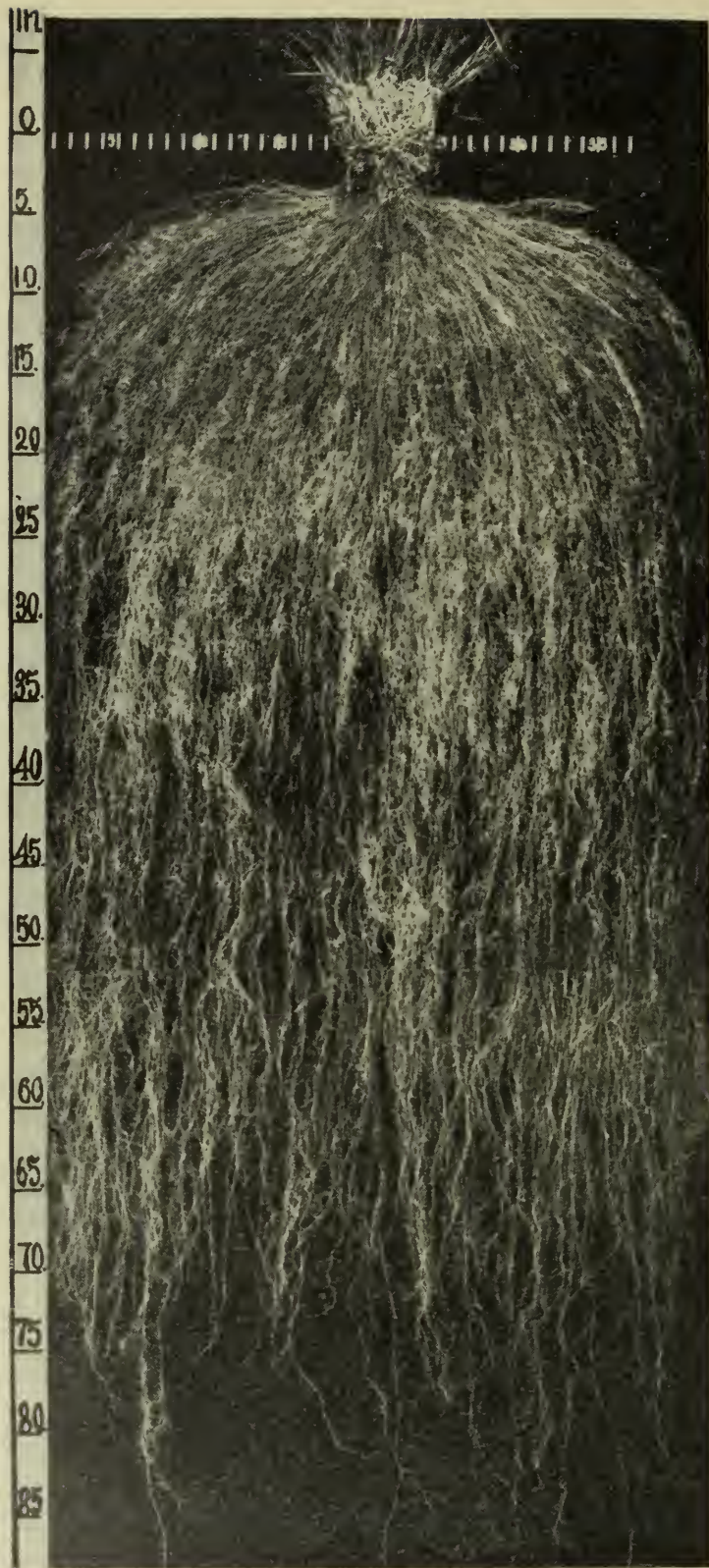
Selection of Land

Crested wheat grass is adapted to growing on a wide variety of soil types and it matters little whether the land is sandy loam, clay loam or clay, so long as the danger of soil drifting is eliminated. To sow the grass on land that is likely to drift is a waste of time and seed, since it is practically impossible to establish satisfactory stands of any perennial grass on drifting soil. However, medium soils such as loams and clay loams, which are fairly well drained, provide the most suitable soil types.

Lands which contain relatively high concentrations of alkali salts should be avoided. In alkali tolerance crested wheat grass is about equal to brome grass and is somewhat less tolerant than slender wheat grass. Lands on which water usually lies for ten days or more in the spring of the year are unsuitable, since the grass will not withstand flooding for many days. While crested wheat grass competes very successfully with weeds under dry conditions, this is not the case when it is grown on soil that is abundantly supplied with moisture. This is one reason why crested wheat grass is not suitable as a lawn grass, where artificial watering is practised.

Preparation of the Seed-Bed

The best soil preparation for seeding crested wheat grass varies with different soil and climatic conditions. One requirement, which is essential, however, under all conditions, is a firm seed-bed. Soil, which is made loose and open by cultivation, dries out rapidly to the depth cultivated and conse-



Root system of a two-year-old single plant of Fairway crested wheat grass taken from the breeding nursery at the Dominion Forage Crops Laboratory, Saskatoon. The root system was excavated and photographed by T. K. Pavlychenko. It has a maximum spread of 48 inches, and a maximum depth of 97 inches.

quently does not supply suitable conditions for quick germination of the seeds and rapid development of the young plants. In addition, a firm seed-bed is the best means of ensuring against over-deep seeding, which invariably results in failure.

Under conditions of limited soil moisture, clean firm summer-fallow or land following intertilled crops such as corn or potatoes, provides ideal preparation, provided there is no danger of soil drifting. Where there is any danger whatever of soil drifting, the land must be prepared in a manner which will make possible the use of stubble, weeds or other trash cover to protect the soil surface. Under these conditions best results are often obtained by drilling the grass seed directly into stubble land which has received no cultivation previously, or into land carrying a protective covering of Russian thistle or other weeds. However, in cases where the surface soil is baked hard and cracked, better results are usually obtained by single disking to break the surface soil before seeding. Where there are dense stands of weeds, particularly Russian thistle, it is sometimes necessary to disk the land lightly or crush the weeds with a packer before seeding, in order to enable the disks of the seed drill to penetrate into the soil. Any cultivation given must be of such a nature that it will not destroy the trash cover. Where Russian thistles have been harvested for hay, earlier in the season, conditions are usually very suitable for fall seeding of crested wheat grass.

In areas where soil moisture is not a limiting factor, a suitable seed-bed preparation is fall or spring ploughing of stubble land, in which case the harrows and packer should follow immediately after the plough. In the case of spring ploughing the seeder should follow immediately after the packer, so that there will be no chance for the soil to dry out before the seeding is done.

Time of Seeding

The degree of success obtained in the establishment of a stand of crested wheat grass depends, to a large extent, upon the time of seeding. Early spring and late fall seedings have been most successful. Crested wheat grass is a cool-climate crop. It thrives under somewhat cooler growing temperatures than do most of our other cultivated grasses. Moreover, the young seedlings are particularly sensitive to dry, hot conditions. A good stand of crested wheat grass may be entirely destroyed, if subjected to high temperatures, especially hot drying winds, during the first four to six weeks after emergence. Once the grass has become well established and has passed this tender seedling stage, it will persist and produce with a minimum of soil moisture, even though the temperatures be fairly high. It is essential therefore to sow the crop at a time which will enable the seedlings to emerge and become established during relatively cool periods.

Several years of experimental tests, during which seedings were made at intervals of fifteen days throughout the growing season, have amply demonstrated the necessity of having the seedlings emerge during relatively cool periods. These tests show that seedings made in the very early spring, that is as soon as the land can be worked or about the time that the earliest seedings of wheat are normally made, and in the fall of the year, late enough so that the seeds do not germinate until the following spring, have almost invariably been successful. On the other hand, seedings made during the period from late May to mid-August have been successful only when periods of unusually heavy rainfall and cloudy, cool weather occurred following seeding. Since such conditions do not normally prevail during midsummer on the western prairies, a high percentage of failures have occurred from seedings made during that period.

Seedings made just as early as the land can be tilled in the spring of the year secure the advantage of favourable moisture conditions in the surface soil, resulting from recently melted snow. Thus there are ideal conditions for quick germination of the seeds. On emergence, the young seedlings are enabled to

make rapid growth and become well developed before hot weather sets in. Seedings made late in the fall of the year, normally late October or early November, have been highly successful. Dry surface soil provides the most desirable conditions for late fall seeding, since the seeds should not germinate until the following spring, and at that time there is usually ample moisture resulting from melted snow to start growth. These seedings have the advantage of getting the young plants away to an early start in the spring of the year. Late fall seedings usually germinate and begin growth two weeks or more ahead of the earliest spring seedings.

While favourable results have been obtained from late fall seedings in most cases, it must not be forgotten that an unexpected warm period following seeding may cause the seeds to germinate, and this followed by low temperatures, before the seedlings have time to emerge, might result in a reduced stand. Up to the present, however, such conditions have not been met with and the practice of late fall seeding is rapidly gaining favour.



Plots of crested wheat grass (right and left) and slender wheat grass (centre) in the third crop year. Note the freedom from weeds and vigour of growth of the crested wheat grass plots.

Fall seedings may be made early in September if moisture conditions are favourable, with the object of giving the grass time to begin growth and become well established before freeze-up. Early September seedings have the advantage of being already well established when growth begins the following spring, and in addition often produce fair yields of seed or of forage the first year after they are seeded. The success of early September seedings depends largely upon favourable moisture conditions at time of seeding. If soil moisture conditions are not favourable at that time, it is advisable to delay seeding until late in the fall.

Depth of Seeding

Deep seeding has been responsible for many failures with crested wheat grass. The seed should not be covered by more than one-half to three-quarters of an inch of soil. Various precautions may be taken to ensure against deep seeding. The most practical and effective means of eliminating this hazard is to prepare a firm seed-bed. The release of the pressure springs above the disks

of the seed drill is helpful in cases where the seed-bed is not sufficiently firm. When the seed-bed is very loose, however, the release of the pressure springs will not alone eliminate the danger of seeding deeply. The practice of removing the covering chains from the drill sometimes does more harm than good. The chains are necessary to cover the seeds properly when the seed-bed is firm. Seeding on a loose seed-bed with the covering chains removed sometimes results in the seeds being deposited in the bottoms of small furrows with a ridge or shoulder of soil at either side. Heavy rains or high winds following seeding often move the soil from the ridges into the furrows, with the result that the seeds, which were originally covered to about the right depth in the bottom of the furrows, become covered too deeply and the seedlings are unable to emerge.

The value of a firm seed-bed in eliminating the danger of over-deep seeding cannot be too strongly emphasized. No amount of precautions in the way of releasing pressure on the disks and removal of covering chains will compensate for a loose open soil. Where this condition prevails, the only safe procedure is to pack thoroughly prior to seeding.

Rate of Seeding

The best rate of seeding crested wheat grass for hay and pasture purposes varies with soil moisture conditions and with the strain or variety used. Where there is a very limited supply of soil moisture, a condition found normally over



Field of crested wheat grass on the farm of Mr. James Rugg, Elstow, Sask. Rows for seed production in background.

the short grass prairie areas of Western Canada, best results are obtained where relatively thin stands are established, whereas the areas better favoured with soil moisture can support more dense stands to advantage.

The size of seed varies greatly in different strains of crested wheat grass. The following figures give the average number of seeds per pound in the large seeded and small seeded types. Large seeded—230,000 seeds per pound. Small seeded (Fairway)—450,000 seeds per pound. If equal weights of seed of each type were sown, one would consequently expect to get many more plants per square foot of area sown with the smaller seed. The results of rates-of-seeding tests indicate that this is the case and it is recommended that the small seeded variety be sown at a lower rate than is best for the types having the larger seeds. The following rates of seeding are recommended:—

Moisture conditions for the area	Pounds of seed per acre	
	Fairway (small seeds)	Large seed types
Dry areas.....	9-10	12-15
Fairly moist areas.....	12-15	18-20

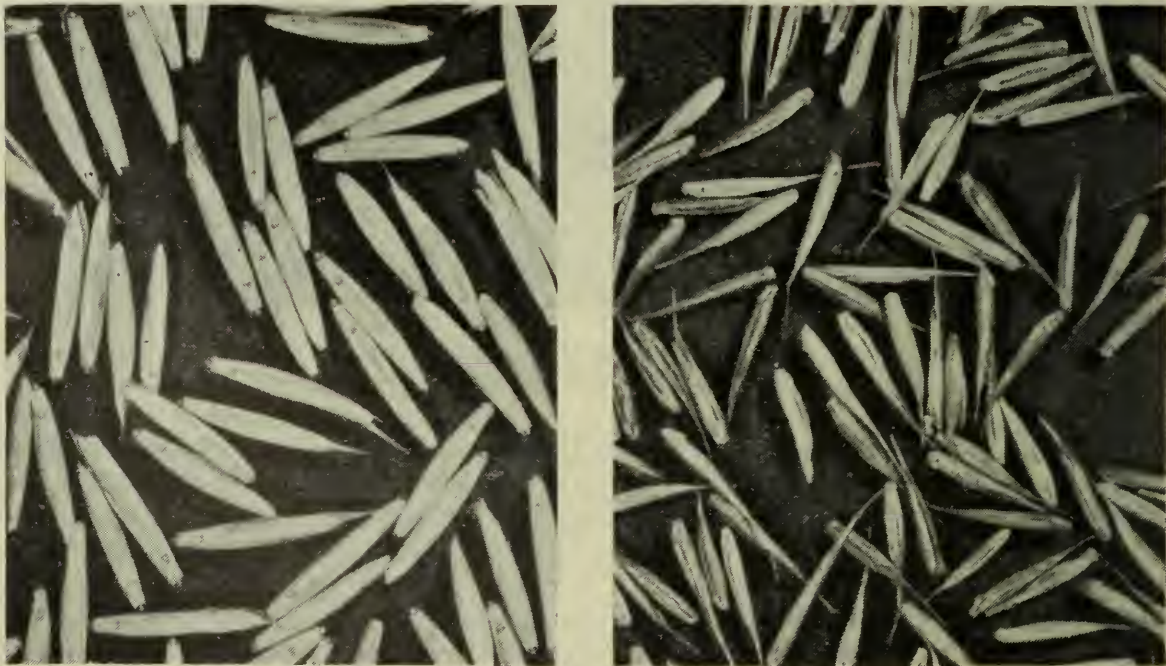
Method of Seeding

The seed may be sown with the ordinary grain drill or it may be broadcast. In the drier areas, drilled seedings, using the ordinary grain seeder, have been most successful. It is necessary under such conditions to place all of the seeds in the soil, and this can best be accomplished through the use of the seed drill. Where seedings are made on land carrying a trash cover which prevents the use of the harrow, the seed drill must be used. In a few cases excellent stands have resulted from broadcasting the seeds into relatively dense stands of Russian thistle late in the fall of the year without subsequent tillage. This practice has not been successful in many cases, however, and cannot be recommended as a general practice.

In areas where soil moisture is not an important limiting factor and where the land can be worked down to a fine condition, without danger of soil drifting, the broadcast method of seeding is usually preferred, since it eliminates the danger of seeding too deeply. Broadcast seedings must be harrowed and packed immediately after seeding, for best results.

Seeding with the Grain Drill

Well cleaned, heavy seed of crested wheat grass will flow freely through the seed outlets of most seed drills. A few drills, however, are so constructed that the grass seed will not flow readily unless it is mixed with some heavier material.



Seeds of slender wheat grass (left) and "Fairway" crested wheat grass (right).
Twice normal size.

The use of lighter grades of seed or the presence in the seed of small quantities of chaff, straw or other forms of inert matter, will cause the stoppage of some of the seed outlets in any drill and will result in an uneven, patchy stand of grass.

In all cases, when the grass seed is being sown alone, without being mixed with heavier material, it is advisable to have an extra man with the drill, in order that a close watch may be kept to see that none of the seed outlets become stopped.

Usually it is advisable to mix the grass seed with some heavier material before it is placed in the seed box of the drill. Cracked wheat is suitable for this purpose. The wheat should be coarsely crushed so that each kernel will be broken into three or four pieces. The finer particles of wheat can be eliminated by running the crushed wheat over a zinc sieve having circular openings approximately $\frac{5}{16}$ " in diameter. In mixing the cracked wheat with the grass seed, the proportion of three pounds of wheat to one pound of grass seed has been found satisfactory. This mixture will flow freely through the seed outlets of the drill. The following figures indicate the approximate setting of the drill in terms of pecks of wheat, in order to sow the specified amounts of grass seed per acre.

Approximate setting when the grass seed is mixed with crushed wheat in the proportion of 1:3:—

Rate of seeding per acre in pounds of crested wheat grass	Setting of the seed drill in pecks of wheat	Rate of seeding per acre in pounds of crested wheat grass	Setting of the seed drill in pecks of wheat
8	2 $\frac{1}{4}$	15	4 $\frac{1}{2}$
10	3	18	5 $\frac{1}{2}$
12	3 $\frac{1}{2}$	20	6

Since no two drills sow exactly the same amount of seed with the same setting, it may be necessary to adjust the setting slightly up or down from the above figures, in order to sow the desired amount of seed. These settings have been determined from actual seeding tests, however, and will provide the grower with a close approximation of the correct setting.

If the grower has well cleaned, heavy grass seed, he may wish to sow it without the addition of cracked wheat or other material. The following figures indicate the approximate settings for the different rates per acre when the grass seed is sown alone.

Approximate setting of seed drill for seeding crested wheat grass seed alone:

Rate of seeding of crested wheat grass per acre (in lb.)	Setting of seed drill in pecks of wheat	Rate of seeding of crested wheat grass per acre (in lb.)	Setting of seed drill in pecks of wheat
8	1 $\frac{3}{4}$	15	2 $\frac{1}{2}$
10	2	18	3
12	2 $\frac{1}{4}$		

Use of a Nurse Crop

Soil moisture conditions determine largely whether a nurse crop can be used safely or not. Under very dry conditions, the use of a nurse crop invariably results in failure. Over the greater part of our short grass prairie there is, as a rule, barely enough moisture available to produce a good crop of cereals. During the drier years the cereal crops sometimes fail. When wheat, oats or other cereal is sown as a nurse crop with a perennial grass, under these conditions, one or the other must suffer. Invariably it is the perennial grass which is crowded out by the more rapidly growing annual cereal. The seeding of any perennial grass with a nurse crop, under these conditions, is a waste of grass seed. Where moisture conditions are more favourable, however, a nurse crop

may be beneficial in that it helps to suppress weed growth. Where a nurse crop is used, it is always advisable to sow it at a lighter rate than is normally used when the crop is grown alone. The practice of harvesting the nurse crop early for hay is also beneficial to the grass, in that it has a better chance to become well developed during the first season.

When the grass is sown without a nurse crop, it is often necessary to use the mower to keep down the weed growth during the year of seeding. In using the mower, it is advisable to set the cutting bar fairly high so as to destroy much of the weed growth without removing a large portion of the top growth from the grass. Usually it is not necessary to mow more than once during the growing season. It is not advisable to mow later than early August.



Freshly ploughed sod of crested wheat grass (right) and slender wheat grass (left). Note the excellent sod-forming character of the crested wheat grass roots.

Regrassing Abandoned Fields and Depleted Range Pastures

Crested wheat is the best grass available for the regrassing of abandoned fields and depleted range pastures in the short grass prairie area. This has been amply demonstrated at the Dominion Range Experiment Station at Manyberries, Alberta, and at other places throughout southern Alberta and southwestern Saskatchewan.

In the three Prairie Provinces there are approximately four million acres of abandoned farm lands. These are mostly covered with weeds such as Russian thistle, mustard, prairie sage and wild barley. While in this condition, these fields are of low forage value, whereas for a number of years after the restoration of a grass cover they are much more productive than the adjacent unbroken prairie. The regrassing of these weed-infested abandoned fields by nature is a slow process, usually requiring from seven or eight years to thirty years, according to soil and climatic conditions and the extent to which the area is grazed. Many stockmen, being short of pasturage, are now seeding abandoned fields to crested wheat grass, and more of this will be done as soon as seed can be obtained at a lower price. On many farms, too, there are certain fields that have not been producing much grain and that are beginning to drift badly. Many of these could be seeded to grass and used for hay or pasture for six or seven years at least. These fields then could be ploughed up and used for grain

production again and another portion of the farm seeded to grass. This practice would help greatly in the prevention of soil drifting and in weed control. Fields, on which the soil is chiefly sand, should be left to grass indefinitely.

Time and Methods of Seeding Abandoned Fields

After a field is abandoned, the sooner it is seeded to grass the better, as it is easier to get a good stand then than after it has been left to weeds for a number of years. The best time for seeding is late in the fall, just before freeze-up. If sown in the spring it should be done as early as it is possible to get on the land, that is, just before grain seeding starts. The seed should be drilled into the ground right among the stubble or weed cover, using an ordinary grain seeder. The pressure springs should be regulated so as to sow the seed at a depth of about half an inch. No cultivation is needed unless the surface soil is baked hard or cracked, in which case a single disking before seeding is advisable. Broadcasting the seed on the surface is not recommended, but if it is sown in this manner the field should be single disked after seeding.



Seeding crested wheat grass into weeds without ploughing in the drought area.

Rate of Seeding for Abandoned Fields

The rate of seeding will depend upon the area to be covered and the amount of seed available. To get a complete stand in the shortest possible time the seed should be sown through every spout of the seeder and at the rate of about 10 pounds per acre. Another good practice is to sow through every other spout and at the rate of about 6 pounds per acre. Where seed is scarce and there is no particular hurry in getting a complete cover, the seed can be sown through every fourth or fifth spout of the seeder and at the rate of two or three pounds per acre. Some prefer to sow one width of the seeder every three or four rods as this involves less labour although a complete stand will not be obtained so quickly. In the case of these widely spaced seedings or where only a thin scattered stand is obtained, it is necessary to allow the plants to produce and shed seed for a few years in order to obtain a complete grass cover. During this period the fields can be grazed during the fall or winter months. After

crested wheat grass becomes established it stands close grazing and tramping remarkably well, being as good as or superior to the native grasses in this respect.

Grass seed should not be sown on bare drifting soil. Ground that is in this condition should be sown to rye or some other cereal first in order to get a cover of stubble. Grass seed can then be sown among the stubble in the fall of the year

Seeding Depleted Range Pastures

During the recent dry years, many range pastures have become badly depleted. Over large areas the native grasses have been almost entirely killed out and the pastures have become infested with such weeds as prairie sage, wild barley, blue-bur, poverty weed, pigweed, cheat grass, club-moss and cactus. Most of these weeds are of low forage value, and after they become established it is more difficult to restore the grass cover.

Where there is still a fair cover of the native grasses the pastures can be renovated most economically by means of controlled grazing. If the pastures are grazed during the late fall and winter, only for a few years, the stand of native grasses will be greatly improved. In case the native grasses have been almost entirely killed out, reseeding may be a practical means of renovation, and a number of ranchers are trying this method. The methods of seeding range pastures are the same as those already described for abandoned fields, the seed being drilled in among the weed cover. Such reseeding tests conducted at the Manyberries Station have been quite successful in a number of cases, and during recent summers several ranchers have been successful in getting good stands of crested wheat grass among the weed cover. If this reseeding is followed by proper methods of controlled grazing, the grass will soon take possession of the pastures and the weeds will disappear.

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