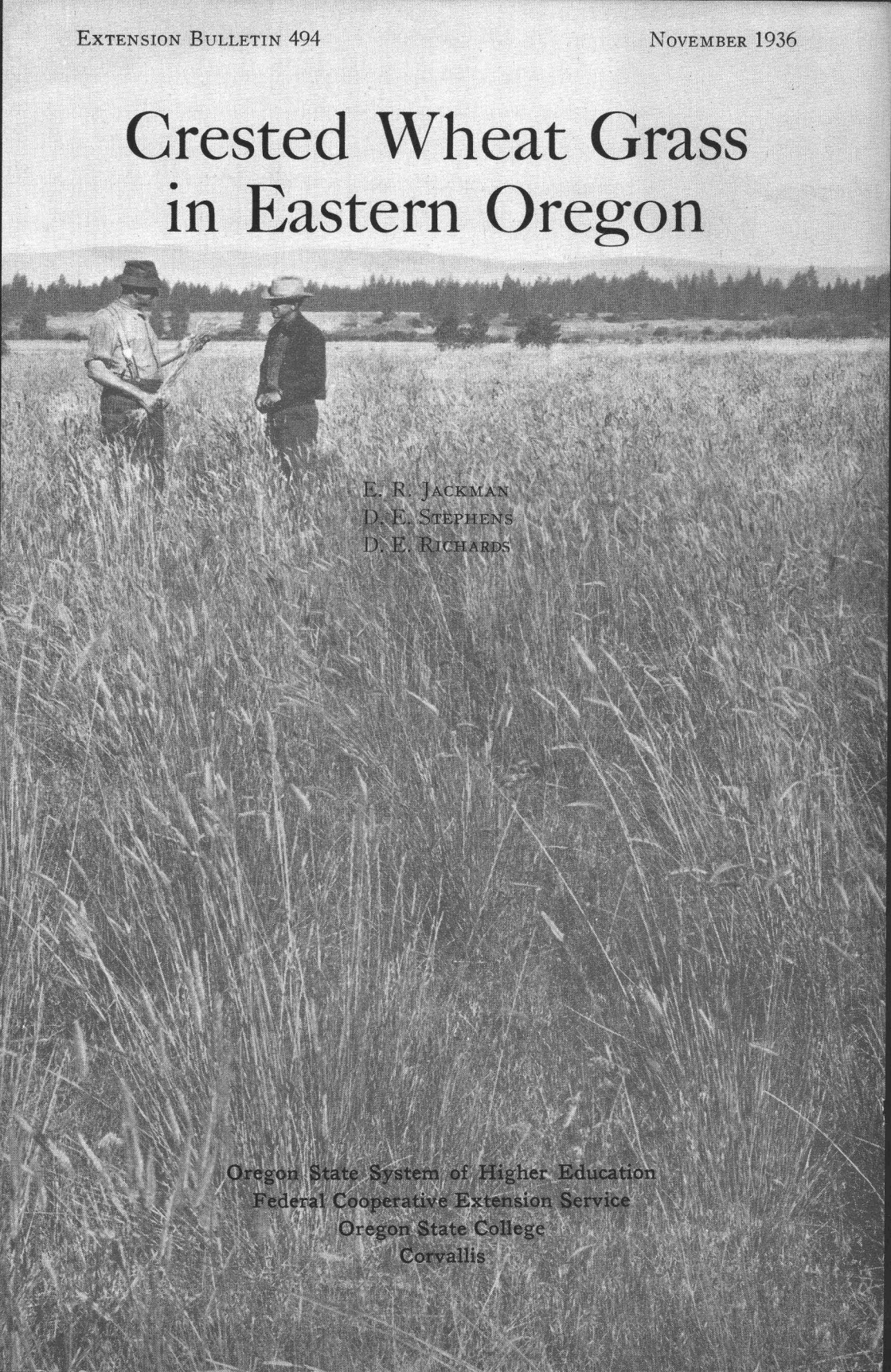


Crested Wheat Grass in Eastern Oregon

A black and white photograph of two men standing in a vast field of tall, dense grass. The man on the left is wearing a light-colored shirt and a hat, and is holding a long-handled tool, possibly a scythe or a pitchfork, and looking down at the grass. The man on the right is wearing a dark jacket and a hat, and is looking towards the first man. The field is filled with tall, thin stalks of grass that reach up to the men's chests. In the background, there is a line of trees and a distant horizon under a clear sky.

E. R. JACKMAN
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Oregon State System of Higher Education
Federal Cooperative Extension Service
Oregon State College
Corvallis

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Picture on cover—

Mr. James Mossie (left) and his field of crested wheat grass near Ukiah. Planted in spring of 1929 mixed with slender wheat grass. For two years the stand of the two grasses was about even. Since then the slender wheat grass has largely disappeared and the field is now nearly 100 per cent crested wheat grass. Pastured yearly with beef cattle.

Photograph by United States Department of Agriculture.

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Foreword

EASTERN OREGON farmers bought seed and otherwise prepared to plant 25,000 acres to crested wheat grass in the fall of 1936. This indicates that interest in the grass has passed the conversational stage. Usually a great many failures follow attempts to grow a new crop, and this bulletin is written with the hope that it may help to reduce the number of unsuccessful plantings.

Recognizing that the grass has thousands of variations in types, the Experiment Stations are now working to segregate various distinct strains which may be especially useful for certain purposes, such as hay strains, pasture strains for high and low elevations, and true beardless types. It is likely that within ten years some of these special-purpose strains will be available. Until then, the standard strain is recommended for most purposes in Oregon.

Crested Wheat Grass in Eastern Oregon

By

E. R. JACKMAN, D. E. STEPHENS, and D. E. RICHARDS*

Eastern Oregon Interested in Grass

THE STORY is told of the old Indian in Eastern Montana who came upon the freshly plowed prairie sod. At the next round of the team the homesteader found him turning the long furrow slice back into the furrow. He grunted, "Ugh! Wrong side up."

Columbia Basin
wants more grass

With wheat prices in the winter of 1932-33 down to microscopic figures, the Columbia Basin wheat farmers began to think that the native sod really was wrong side up and that some of the less productive wheat lands should return to grass.

Wheat farming as carried on in the Columbia Basin is probably as efficient a type of farming as found anywhere. Rate and date of seeding, time of plowing, varieties, adaptation of machinery to size of operation, summer-fallow tillage—all these have been settled with an approach toward perfection unknown in most farming communities. Yields have been maintained fairly well, but farmers have noticed that the soil, like the old gray mare, is not what it used to be. They say it washes more, blows more, and crusts more. In some places it is harder to plow.

Here and there all over the area, the more thoughtful of the growers have begun to cast about for remedies. Many are turning to the trashy fallow system, while others are experimenting with livestock, thinking that perhaps wheat land should revert to pasture occasionally. One-crop farming for a long period of time is bound to bring, sooner or later, serious troubles in the form of reduced fertility, soil erosion, and plant diseases.

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Acknowledgments. The authors thank Professor G. R. Hyslop, In Charge of the Division of Plant Industries, for his aid in preparing the bulletin; he suggested its publication and read and corrected the manuscript. Dr. D. D. Hill, Professor of Farm Crops and H. A. Schoth, Agronomist, Bureau of Plant Industry, United States Department of Agriculture, also made many helpful suggestions. All of the Eastern Oregon county agents helped in obtaining pictures and made suggestions for the bulletin. Farmers and ranchers of Eastern Oregon contributed generously of their experience.

The Soil Conservation Service began demonstrations in the area in 1934. On these demonstration areas steep slopes were seeded to grass, gullies controlled, and tillage practices used which were designed to get the rainfall into the soil and prevent soil washing and soil blowing. The theory is that if soil is mistreated it will move on.

Governmental activities
have stimulated interest.

In 1934, also, the AAA fostered considerable interest in grass by allowing it on the "contracted" or "adjusted" acres which could be found on 95 per cent of the farms of the area. And in 1936, the Agricultural Conservation Program arrived with the policy of changing some wheat lands into ex-wheat lands by converting them into grass. So in Oregon's wheat belt, low wheat prices, eroding soil, and governmental agencies have combined to make large numbers of people grass minded.

In the range livestock counties, a demand for grass information has been developing for years. The millions of acres of public domain in Oregon on the high desert never did have a very high carrying capacity, because a five- to eight-inch rainfall does not create lush vegetation. The public domain being free, no one could afford to protect or improve it because someone else, perhaps from another state, would hurry his stock to the good area. Hence the so-called "free range" was still free but no longer range.

Range counties are
grass conscious.

Many private range lands have suffered also. As a rule, when seasons are normal, the private ranges do well enough. But dry seasons have a distressing habit of coming in groups, and a stockman caught in such a cycle is like a man with a bear by the tail. His first dry year results in thin stock in the fall and no fall grass. Feeding of hay starts early. The drought reduces his supply of hay which is prohibitive in price; and stock often is necessarily forced on to the range in the spring while grass is only half-a-bite high. But the preceding dry year allowed no storing of food in the roots of the bunch grass, which consequently starts late and makes a scanty growth. The stockman therefore is forced against his will to hurry the stock to hay and in turn to hurry them to grass. A succession of three such years may ruin a range which has been nursed carefully ever since the Indians owned it.

Many of the privately owned ranges have gone to downy brome grass which is popularly known as "cheat", "broncho grass", "tickle grass", or "needle grass". And in addition, much range land was plowed at one time under the delusion that a homesteader's muscle contained magic elements which could transform range to good farming land. The homesteaders are gone. Some tangled barbed wire around a makeshift corral; such odds and ends as the

head of a broken doll, a stove lid, some crumpled bed springs, and a woman's shoe with the sole worn very thin, are now mute reminders that human tragedy always follows an attempt to coerce, rather than to cooperate with nature.

The stockmen would like to put these once-plowed acres back to grass and would like to restore good grasses to those ranges where the unwanted grasses and weeds are now largely supreme.

Readers must not infer that all of the privately owned ranges have deteriorated. This is far from the case. For example, Shaniko, Long Creek, Izee, Catherine Creek, and many other locations offer proof that grass can be used and still kept.

Stockmen are thoroughly awake to the value of grass, and they want more and more information about it. So both grain farmers and livestock men are asking questions about grass.

Fortunately, both Experiment Station and Extension Service are ready to offer some help. Grass work has been carried on at the

Information is available. Moro Experiment Station since 1914, at the Pendleton Station since its establishment in 1929, and at the Union Station since 1910. In addition, Eastern Oregon county agents began seeding grass nurseries in 1925 and since then have tried in more than 100 locations all of the grasses of which seed has been available.

In both the station and field trials, it was apparent at once that crested wheat grass was an outstanding dry-land grass. In all of the real dry locations other grasses usually died quickly, but wherever stands were obtained the crested wheat grass survived.



Grass nursery, Ukiah, Umatilla County. More than 100 such nurseries in Oregon have demonstrated the superiority of crested wheat grass.



Marion Wagner, Summerville, standing in a field of crested wheat grass. 1935.

History of Crested Wheat Grass

Crested wheat grass comes from the high arid plateaus of Russia and Siberia. That area has supported a more or less nomadic type of agriculture since the dawn of history. When Genghis Khan and his cavalry appeared out of the high Asiatic steppes to overrun most of the civilized world of his time, his enemies marveled at the toughness of his hordes of Mongolian ponies. They grazed on crested wheat grass, as did the goats and other animals upon which his tribes lived. Centuries passed, and a wandering plant explorer for the United States Department of Agriculture found crested wheat grass in Siberia and sent seed of it to America in 1898.* About 1915 it began to attract attention and now it promises to be worth more than all of the Khan's treasure.

Habits and Adaptability of the Grass

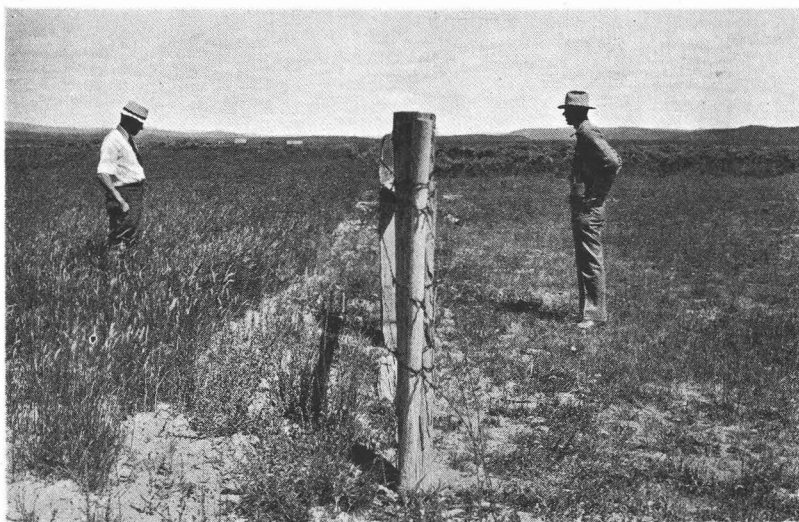
In appearance and habits of growth the crested wheat grass is much like our native bunch grass, the blue bunch wheat grass. Like our bunch grass, it is a perennial which expands into clumps or bunches by means of very short, underground shoots. Like the blue bunch wheat grass, it is rather leafy and the leaves make palatable winter feed. The crested wheat grass is easier for the farmer

**Crested Wheatgrass as Compared with Bromegrass, Slender Wheatgrass, and Other Hay and Pasture Crops for the Northern Great Plains.* United States Department of Agriculture, Technical Bulletin 307.

to grow because the crop seeds more heavily, its seed does not shatter so readily, and it offers no particular harvesting or threshing difficulties. Crested wheat grass is also more constant in production.

Crested wheat grass begins growth earlier in the spring than native blue bunch wheat grass, starts more quickly after the fall rains, and is more palatable. After a long winter the livestock and their owners just stand around waiting for grass to start. The crested wheat grass comes out green from under the snow, and this early growth is much appreciated. Some stockmen say that crested wheat grass will stand more grazing than other grasses without severe damage, but there is no exact experimental evidence to prove this.

Three thousand acres of it, mostly in small trial plots scattered over every Eastern Oregon county, testify to its adaptability to Oregon conditions. It grows in the adobe soils of Harney County, in the pumice and sand of Deschutes, in the silt loam of Sherman, and in the rich lake bottom of Union County. But in Western Oregon it does not thrive. It will grow there and live from year to year, but many other grasses yield more. Cool weather suits it best, and it shows the most promise at elevations above 2,500 feet.



Crested wheat grass on left; native vegetation on right. Oliver Brothers ranch, Bear Valley (Grant County).

Photograph by United States Department of Agriculture.

Dry-land farmers are continually looking for the magic plant that will produce tons of forage without water. Inasmuch as it takes about so many pounds of water to produce a pound of dry matter, it is certain that such a plant will never be found. Crested wheat grass is drought resistant in the sense that it will live under conditions so dry that most other grasses die. It is able to do this by its convenient habit of becoming dormant, if necessary, for months at a time, during dry periods.

So far as the writers know, there are no cases of death of crested wheat grass plants due to cold. In one high valley where 50 below zero has occurred twice during the life of a planting, a stand of crested wheat grass has taken it and liked it.

If a stand of crested wheat grass can once be established—that is, if it can be coaxed through the seedling stage—it is quite remarkable in its ability to take care of itself in the battle royal which weeds of all kinds constantly stage. Many of those who first planted crested wheat grass plowed their fields the second year, under the impression that they had only weeds with some puny grass plants hopelessly submerged



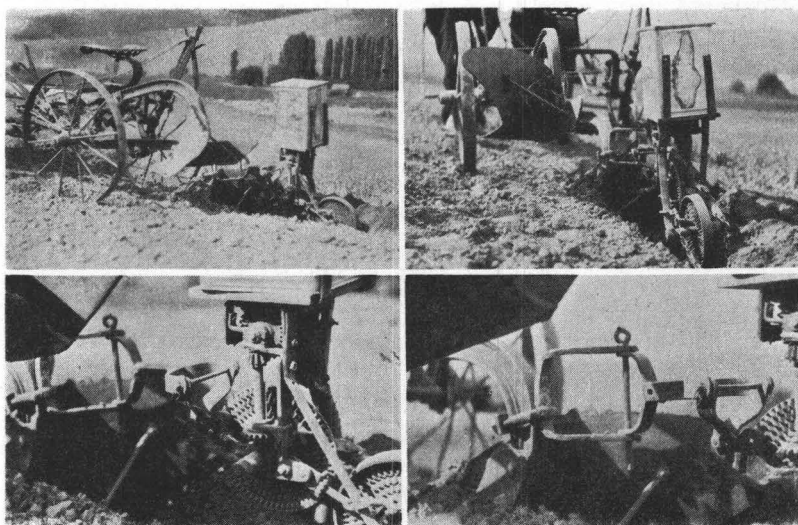
One of first range seedings of crested wheat grass in Oregon. Fifty acres on the J. E. Smith Livestock Company ranch near Pilot Rock. Percy Folsom, manager of ranch, on right. The grass has crowded out the downy brome except where there are skips or thin places in the stand, as in the center of the picture. This field was pastured severely for three years after seeding. Seeded in spring of 1930.

under tarweed and tumbling mustard. A few, with more curiosity, waited and by the third year were rewarded with fields almost clean of weeds. The grass has a really remarkable "will to live".

A good stand of crested wheat grass, if treated right, effectively resists the encroachments of most weeds. In three years' time its root system completely fills the soil, leaving no place for weeds to grow. But livestock prefer the grass to weeds. If there is too much pasturing, the stock will eat the grass to the ground, leaving the weeds to go to seed. Such treatment will eventually weaken the grass to such an extent that it cannot compete successfully with weeds. The same statements apply to native bunch grass.

Methods of Planting

If the crested wheat grass seed has been cleaned properly, it will run through a grain drill. A double disk drill is preferable to a single disk, and a single disk is preferable to a hoe drill, but the latter can be used. An external force feed is better than the usual common internal force feed type. Broadcasting is satisfactory if no drill is available. The first requirement in getting a stand is a firm seed bed, and the second is shallow planting. It is nearly impossible to plant shallow unless the seed bed is firm. A good method



Four views of small seeder designed by Joe Belanger, Heppner, to seed grass in furrows behind a two-way plow. Parts from old grain drills were used.

Glen L. Richards Plants on Pastured Wheat Land

"From my experience, I find in this locality the best time for planting crested wheat grass is in the fall and on a real firm seed bed, at the rate of about five pounds per acre.

"Any grain drill of the later type, set in the fifth notch, with every other hole stopped, will seed about five pounds. It is necessary to have a man on the drill to keep the seed agitated with a stick.

"I find a good method is to plow ground in spring, seed lightly to wheat, and pasture off. This makes an ideal seed bed. It also gives some return and is inexpensive. The grass seed should not be covered more than one-half to one inch deep and should not be run through the hoes, but ahead of them.

(Signed) GLEN L. RICHARDS
Condon (Gilliam County)"

for fall planting on loose fallow is to remove the tubes from the shoes of the drill and to let the seed fall on the surface, covering it lightly by drag chains. If planted in the spring the seed should be covered about half an inch deep.

Crested wheat grass can be planted either in the fall or early spring. On land that is not too badly infested with weeds, fall planting is best, but where weeds are likely to give trouble, spring planting may prove better, providing the weeds have been killed before seeding.

W. R. Hawley Broadcasts

"I did not sow any crested wheat grass on this ranch with a drill. My son sowed it broadcast, rode a horse and carried a large bucket of grass seed. The horse's tracks served as a guide. First we disked the ground about four inches deep, then harrowed once with spike-tooth harrow then sowed the seed then harrowed again and last packed the ground pretty hard with a roller. Seed was all planted in the spring.

(Signed) W. R. HAWLEY
McEwen (Baker County)"

In general, fall planting is best in the drier, hotter areas such as the low elevation lands near the Columbia River. At higher elevations, spring plantings are likely to be just as successful.

A Weedy Stand Plowed Down

"In the fall of 1932, I seeded about 20 acres of the grass seed using a Superior disk to prevent going too deep. I started by seeding on the barley side of the feed, but after making two rounds I found that I was seeding about 30 pounds to the acre so switched to the wheat side. Here I had difficulty in getting seed to come out, so had to let my hired man drive the team while I walked behind and with a wire gouger worked away at the feeds so that I got them to work fairly satisfactorily. In all, I sowed about ten pounds to the acre by doing it this way. This was on summer-fallowed ground, worked down in the usual way.

"The following spring my 20 acres proved to be, as I thought, nothing but weeds (tar weed, pepper grass, and mustard with very little grass noticeable) so I weeded it all out with a rotary rod weeder. That is, all but the two first rounds. Here there seemed to be a pretty good stand of grass. The following fall (1933) after harrowing the ground down, I again seeded it to grass. I did it in exactly the same way as before and had what I would consider an almost perfect seed bed. The seed was being covered from one to two inches deep, although I don't believe it averaged more than one inch deep. Rows were seven inches apart.

"About a month after seeding a terrible wind came up and blew for about a week, so my grass patch turned out to be a regular blow spot. I thought it had all blown away as deep as plowed. However, next spring there was some evidence of grass, which has picked up ever since and is now looking fine. In fact, it is so thick in places that it did not all head out this spring. The weeds have for the most part been choked out. I now have 30 acres in grass.

(Signed) OSCAR E. PETERSON
Ione (Morrow County)"

Methods of preparing the seed bed in Oregon have varied according to the type of land. FOR PLOW LANDS a number of plans have been followed with success (see letters on pages 12, 13, 14, 15, and 20). No one method will fit all farms, but those described below have wide application.

Seed-bed preparation
varies with land type.

1. Plant in the fall in grain stubble with no preparation; just drill the seed in. Cheapness recommends this method which provides an ideal seed bed—usually just about firm enough. A disk drill works best, using the springs to force the disks in so that the seed is barely covered. This method should not be used for stands intended for seed production since weeds will be bad for a few years. Nor should it be used on very weedy land.

Arthur C. Jaeger Cut Volunteer Wheat and Weeds for Hay

"We all know that we need a firm seed bed, and if we get that, we will get an ideal seed bed for weeds, too.

"In the late fall of 1933, I sowed about four pounds of crested wheat grass seed on land that was summer fallowed by disking it the spring before instead of plowing. After disking, the land was harrowed and rodged before seeding.

"I sowed it in rows 35 inches apart by stopping up four holes and seeding through the fifth hole. I didn't change the feed in the drill after sowing about 60 pounds of wheat through a seven-inch Kentucky disk drill. The drill had drag chains.

"I raised the disks out of the ground so the seed was barely covered, in some places you could see the seed that wasn't covered, but when the snow and rains came, it covered it enough to sprout and come up.

"I intended to cultivate the next spring, but delayed until there was too much volunteer wheat and weeds. So I let the grass grow till it was well headed out and the weeds were not too ripe to shatter out. Then I cut it for hay.

"I got about 1,500 pounds of nice green hay per acre off of this land besides a good stand of crested wheat grass.

*(Signed) ARTHUR C. JAEGER
Condon (Gilliam County)"*

A Jefferson County Experience

"I seeded the crested wheat grass in the fall in October on ground plowed in the spring and harrowed down well, broadcast with an alfalfa seeder, five pounds to the acre and harrowed with a light harrow afterwards. I believed the seed too light to feed through a drill and was afraid it would be too deep. Some I never harrowed after it was seeded, but this did not do so well, for the wind blew it off the higher spots. I believe five pounds of good seed is plenty, as it does better if not too thick. As the grass gets older, it seems to get ahead of the weeds and other grasses, especially those grasses that come from the seed every year. I fed the straw to cattle, and they ate it fairly well. It acquires a great root system after the first year and is fine to stop erosion.

"If cows are pastured on it, this grass makes the finest milk and stays green as long as there is moisture in the ground.

"I would recommend fall seeding in the dryer districts.

*(Signed) F. R. WHARTEN
Ashwood (Jefferson County)"*

2. Plant in the fall on fallow. Wait for fall rains, harrow or use the revolving rod for weed control, pack the land with rollers if necessary, and seed. Do not use springs, and if there is any doubt about the seed bed being too loose, remove tubes and let the seed fall on the surface. This is the ideal way to plant for seed production, as the grass will produce seed the following year.
3. Seed grain, preferably rye, in the fall or spring, pasture closely all summer and seed as soon as the fall rains come. This is an almost failure-proof method, providing pasturing has been close enough to keep all weeds from seeding. Close pasturing may be inadvisable on blow soil.
4. Fall plow, leave rough over winter, work the land early in the spring to kill weeds, and seed.
5. Spring plow very early, pack with a heavy packer or with a double disk, with the disks set straight, harrow, and seed. If this method is followed, seeding *must* be done

early. A difference of two weeks in seeding makes the difference between success and failure. Do not use this method on blow soils.

FOR UNPLOWED RANGE LANDS. Oregon experience and practice may be summarized as follows:

1. Plow furrows from 3 to 10 feet apart, following the contours of the hills, and fall plant in the bottoms of the furrows. (Joe Belanger, County Agent at Heppner, has improvised a seeder for attaching to plows in using this method. See pictures on page 11.) If this method is used, the grass should be allowed to go to seed every year. It will then gradually spread and fill in the spaces between the rows.
2. If there is sufficient cover, burn the native growth as soon as mature enough and seed in the fall in the ashes, either by broadcasting or by using a disk drill. Another method of getting the seed into the ground following a burn is to drive a band of sheep over the seeded area.
3. If the nature of the land permits, summer-fallow patches or strips here and there, beginning in the very early spring and disking instead of plowing. Seed in the fall



Crested wheat grass, Union Experiment Station. Rows $1\frac{1}{2}$ feet apart as shown in this picture are too close for seed production. Rows 3 feet apart are more desirable.

J. H. Russell Planted with Garden Seeders

"I seeded my grass for seed production with two Junior planters attached behind a corrugator. The corrugator was set to make only a very shallow furrow and the drill was attached behind the shovels so that the weight of the drill would put the seed in deep enough. I found that where the ground was too loose and the drill planted deeper, the stand was very poor. The seed bed should be in proper condition so that the seed can be planted as shallow as possible and still be covered.

"I planted this seed in the spring, but I am of the opinion that the fall seeding would be much better. I think that if seeding is done sometime from the middle of August to the first of September, in this country at least, a better stand will be secured with less irrigation. Also for seed purposes, a fall seeding would get most of the annual weeds germinated and the majority of them would kill out during the winter. I also think less cultivation would be required than on the spring seedings.

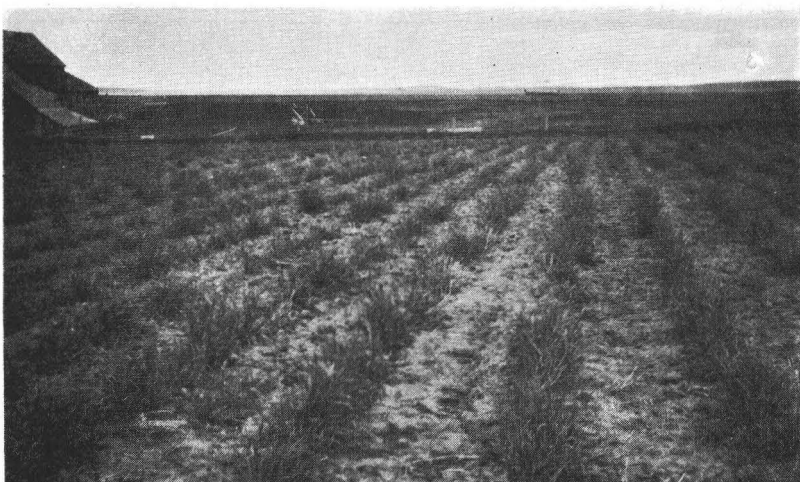
*(Signed) J. H. RUSSELL
Vale (Malheur County)"*

only in these patches. If the grass is allowed to go to seed in alternate years, it will spread gradually.

4. Pasture the area very closely so that practically *all* vegetation will be eaten and no grass or weeds will go to seed. Fall seed after a rain and either cover with a brush drag, a harrow, or by driving sheep over the seeded ground. This is practicable only for small areas around buildings and similar places.
5. Spring seeding is usually out of the question on unplowed land—too much weed competition.

FOR IRRIGATED LANDS the following methods have been practiced:

1. Seed in grain stubble in September. This is possible, of course, only if water is available for irrigation.
2. Disk grain stubble to kill weeds and seed in late fall.



Crested wheat in rows, Lloyd Smith farm, Mayville, April 16, 1936. Seven-acre field. Seeded in spring of 1935 with hand seeder 36 inches apart, about $1\frac{1}{2}$ pounds per acre. Had been double harrowed with spike-tooth harrow before picture was taken. About 75 pounds of seed per acre was threshed in 1936, the year of planting.

Seeding on Irrigated Land

"I use a single disk drill. I set it on the wheat side in the third notch from the bottom and the drill seeded crested wheat grass seed at about 10 pounds per acre by stopping up every other hole.

"If you want seed through every drill hole my suggestion is that you mix the crested wheat grass seed with oats (this is for irrigated land) and set the drill for oats on the lowest notch. This seeds about 10 pounds of oats and 8 pounds of crested wheat grass seed per acre. I did this in 1934 with successful results.

"There is one point that I want to stress. A farmer or livestock man should not get discouraged with the crested wheat grass that shows up the first year after seeding. Crested wheat grass plants are so hair-like when they first come up that they are difficult to see the first year.

*(Signed) GEORGE STOCKBERGER
West Side (Lake County)"*

3. Seed in the spring with a grain nurse crop. If this method is used, the grass seed should not be put in as deeply as the grain. Preferably harvest the nurse crop for hay rather than grain.
4. Seed alone, either spring or fall on plowed land. This is the best procedure for raising seed. Weeds and grass can be cultivated. If seeded in the spring, sometimes a seed crop can be obtained the first year.

For seed production in Eastern Oregon on either irrigated or dry land, crested wheat grass should be planted in rows three to four feet apart. If the land is steep, these rows should follow contours. Rows up and down hills invite severe erosion. Ordinary grain drills are used with partitions of wood, tin, pasteboard, or canvas to direct the seed into the proper holes. Row seeding can be done by plugging the unused holes with small bags of dirt. R. M. McKennon, County Agent of Gilliam County, writes:

Planting for seed production is done in rows.

"We have found that with most drills it is unnecessary to partition the drill box. There are sufficiently large pockets in the bottom of the drill box to get in enough grass seed to go a considerable distance. If the operator of the drill will keep a gallon can of seed in the drill box, he can fill the pockets very easily without stopping.

"Small acreages are best seeded with the hand garden seeder, but it is a simple matter to prepare the ordinary drill for seeding in rows. Most of our drills here are of the 7-inch 18-hole type, and to make them come out even, it is necessary to seed out of two holes and leave four in between each two holes, like this:

— 00 — — — 00 — — — 00 — — —."

The double row method described above has the advantage of helping to eliminate skips, but at low elevations single rows are better. For single rows the 18-hole drill may be arranged to seed like this: — 0 — — — 0 — — — 0 — — — 0 —. In this case, the driver must put the drill wheel outside of the wheel track made on the previous round.

When planted in rows, from two to three pounds of seed per acre will be required. For planting in close drills, from five to ten pounds are required. Because of variations in the seed, no precise directions can be given for setting the drills. If the seed is about average and the drill set at the last notch on the wheat side so as to seed the lightest amount possible, about five pounds per acre will run out, provided it is kept moving by fre-

Seed is planted at rate of two to three pounds per acre.

C. A. Nish Believes in Double Rows

"The drill was an 18-7 Superior single disk and set in the sixth notch about the same as we sow wheat, except 12 of the feeds were stopped up, making the drill sow four double rows thus. /iiii/iiii/iiii/. The crested wheat does not run very well, and it took one man to keep the runs open.

"It was sown on good summer fallow about October 15, and before sowing the ground was packed as hard as possible with a roller. We made every effort to keep the seed as shallow as possible, but we lost some by getting it too deep. We sowed between 4 1/2 and 5 pounds, and on most of the ground we got a fair stand.

"It seems to me that this crested wheat grass might be sown on fall stubble with a disc drill and get favorable results, as one could barely cover it that way.

*(Signed) C. A. NISH
Mikkalo (Gilliam County)"*

quent attention to all of the spouts. One should check the drill and close it to the lowest notch at which the seed will feed regularly from the wheat side. Ten to fifteen seeds per foot in each drill row will give satisfactory stands if other conditions are right. If the seed is the least bit chaffy, it must be stirred frequently to keep it feeding.

J. W. Dyer Gets Good Stands on Wheat Land Pastured by Sheep

"I got best results from seeding on ground that had been pastured off and was fairly well packed. I used an ordinary grain drill set shallow with drag chains. I sowed in the fall, the drill was set down to the lowest possible notch, sowing about seven pounds of seed to the acre. It is a good plan to pull the tubes out of the lower sockets and let the seed scatter behind the disk. I have had poor success sowing on loose ground.

*(Signed) J. W. DYER
Mayville (Wheeler County)"*

Although occasional windless years occur when any method will give results, it is unsafe to seed grass on newly plowed blow soils. The young seedlings grow so slowly the first year that they offer no resistance to wind. It is best to seed on pastured ground or on grain stubble as mentioned above. If this is not practical, seed in furrows or strips as mentioned for range lands.

Seeding newly plowed blow soils is risky.

Care Needed the First Year

The grass should not be pastured the first season, or at least not until rather late in the fall when the young plants have become firmly established. The young seedlings are weak—almost hair-like—and they need coaxing. If weeds are very bad, they should be clipped to prevent seed formation. Some growers have raked weeds into windrows and burned them, but this kills all of the grass below the windrows.

One Man Seeded 35 Acres by Hand

"I drilled 35 acres last fall using regular Planet Junior garden drills. We used about two pounds of seed per acre, drilled about one-half inch deep. One man with a hand drill can cover four or five acres per day with rows 36 inches apart. The drills were set to plant about 25 seeds per foot, or one every half-inch.

"Because of the soil crusting in the spring, this fall planting gave us considerable trouble. We cultivated between the rows but nothing could be done close to the grass—it merely had to survive if it could, and it seems that it could, as it appears that all that came up has lived. There is a fair stand (for a seed crop) but a little thin in places. Soil-washing caused some damage with the rapid melting of snow early this spring.

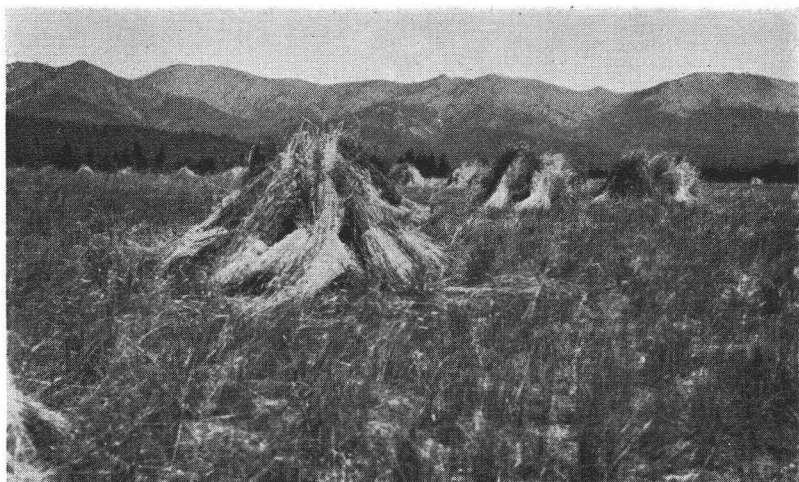
"About the first of April, after the grass had just come through the ground, the thermometer dropped to zero, but no harm resulted to the crop that could be noticed.

*(Signed) E. E. ARANT
Baker (Baker County)"*

When planted in rows for seed, the land should be cultivated enough to kill all weeds. This can be done with a corn cultivator or, after the first year, with a spring-tooth harrow. The earlier the cultivation and the fewer the weeds, the more seed will be found in the sack.

Seed Harvesting

The seed shatters quite easily, so cutting should start before all the seed is fully matured. When the heads are straw-colored and the stems are still green, the grass is ready to cut. At this time the seed is in the stiff dough, but if one slips a head through his hand with a very light pressure a few seeds will shatter out. Seed yields will vary from 100 pounds or less per acre to more than 500 pounds, depending on the season and the number of weeds present. Weeds will not hurt the stand, but they most emphatically hurt the seed yield. In the Columbia Basin not much seed can be expected in very dry years. At the Union Experiment Station over 900 pounds per acre have been obtained. Clean seed usually weighs about 23 pounds per bushel, and a purity of 90 and germination of 90 to 96 is considered good. Growers have experimented with the following harvesting equipment: mowers with bunching attachment, binders, headers, self-rake reapers, and with com-



W. R. Hawley field of crested wheat grass near McEwen, Baker County. Cut for seed with a binder in 1936.

bines. Unless a combine is used, the seed harvesting should start about 4:00 a.m., and should stop when the day gets hot.

For most conditions, the binder is the most satisfactory harvesting machine. It was not designed to cut grass seed, but by humoring it some, it does very well. It should be equipped with pans, boxes, or canvases under the platform and under the deck and bundle carrier so as to catch all of the shattered seed. Frequently, 20 per cent of the entire crop is recovered from these pans or canvases. Walter Holt of Pendleton reports that a satisfactory method is to bind, haul to a central place, and shock in long ricks on building paper, thereby saving many pounds of seed per acre. The bundles are thrown directly into the threshing machine from the ricks.

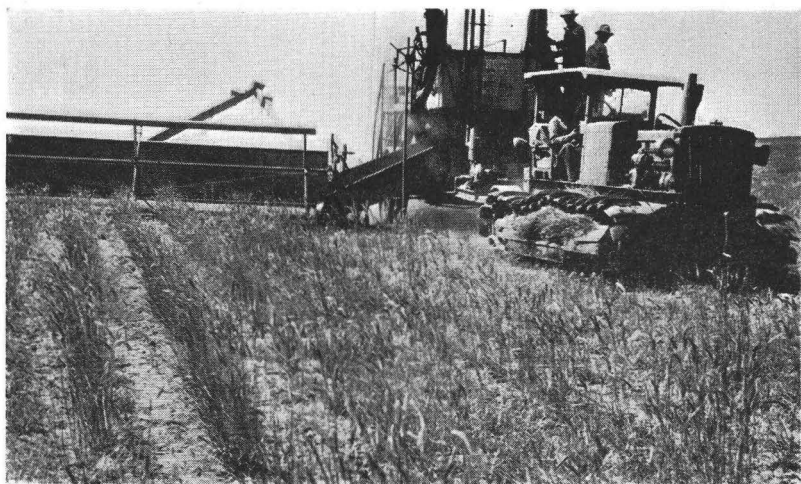
In cutting, the bundles should be handled carefully. Some growers stop the binder when the bundle carrier is full and remove the bundles by hand instead of dumping them. Only two kickers are needed. The one which hits the heads and shatters the seed might better be removed. If the growth is heavy, it is best to cut only part of a swath to avoid unnecessary shaking and "wooling" of the grass. Hay racks or slips should be covered with canvases.



Cutting crested wheat for seed with a mowing machine with a tight box attached to sickle bar—L. W. Child farm, Shutler Flat (Gilliam County) July 9, 1936. This method saved all the seed but required additional time and labor. As soon as the box was full, the seed was pitched directly into a truck.



Heading ripe crested wheat grass on the W. A. Holt farm near Pendleton. It is usually impossible to thresh directly from the header, so the headed material must be stacked in narrow ricks.



E. A. Smith, Condon, combining his 17-acre field. The combine can be used only on fields which ripen uniformly. It is the cheapest harvesting method but usually results in loss of considerable seed.

In general, the binder is the best all-round harvesting machine. The other methods discussed below will not work under all conditions, or will waste part of the seed. Whatever method is used, the less the handling of the cut material, the less will be the waste of seed.

If the grass is mowed, it should not be raked. Even mower windrow attachments shatter the seed. A box or canvas attached to the mower is better. One man can then follow the mower and rake or lift the grass and put it in small bunches out of the way for the next round.

The mower system
may be used.

Several Oregon growers cut with a header. In this case, the header should be equipped with pans underneath as described for the binder. Header boxes should be tight and the headed material stacked in very narrow ricks to avoid heating.

The header is satisfactory.

The combine can be used as a rule only for solid seedings which ripen evenly or for shallow land areas where the growth is not very large. Tall stands are usually impossible to combine because the long green stems wrap around shafts, refuse to pass through the machine, and cause trouble all the way. Most fields ripen unevenly, moreover, and loss by shattering is likely to be

The combine can be used
for solid seedings.



Cutting crested wheat grass with reaper on the A. C. Jaeger farm, Condon, July 20, 1936. Seeded in rows (9 acres) in fall of 1933. Volunteer wheat hay cut in 1934; 100 pounds of seed per acre cut in 1935; 1936 yield about 200 pounds per acre. Soil two feet or less in depth; rainfall about 11 inches.

H. R. Bradley Advises Feeding Slowly

"I have a Case threshing machine, size 28 x 46. In threshing crested wheat grass, I shut the wind clear off and close down the adjustable grain screen until it is practically closed up. I run the machine at the same speed used in threshing grain. Bound bundles of crested wheat grass must be fed into the machine slowly.

"Last year I threshed some crested wheat grass seed that had been cut with a mowing machine and bunched. I found this very difficult, as the straw is so tough it winds around and tends to plug up the operation.

*(Signed) H. R. BRADLEY
Lakeview (Lake County)"*

excessive. Earl Smith of Condon and Oscar Peterson of Ione combined successfully in 1936. If the seed drops in price to where the cost of harvesting is more of an object than the saving of seed, then the combine will have a wider use.

Combined seed should be watched carefully. If there is the slightest evidence of heating, it should be spread on a floor, piled only two to six inches deep, and stirred frequently until dry.

Self-rake reapers have been resurrected and used for harvesting grass seed. They work satisfactorily if the grass is cut fairly green. In some places or in some years, the crop may be too short to bind, and in that case the reaper may be the next best implement. It leaves the grass in small piles convenient for hauling.

The self-rake reaper may be used for green cutting.

Threshing Methods

A stationary thresher will do a fairly good job, but some minor adjustments may have to be made in order to save all the seed. Small stationary machines on the branch experiment stations have been used for many years. It is usually necessary to shut off nearly all of the wind. Sometimes it is advisable to lower the back end of the machine. County Agent R. M. McKennon of Gilliam County, who has helped adjust several combines, advises:

"1. Reduce the speed of the cylinder to about two-thirds the normal rate.

"2. Lower concave teeth just as far as possible, and if the straw is dry, do not have more than one row of concave teeth. In some cases it is better to have no concave teeth at all. The biggest difficulty in getting the seed through the machine is that the straw breaks up into short particles which clog elevators and cleaning equipment.

"3. Shut off most of the wind from the shoe fan, but leave enough so that the shoe screen is not loaded too heavily. The amount of wind on the shoe depends entirely upon the speed of the machine. Care must be used in adjusting the speed so that seed is not blown out of the machine but so that there is enough wind to keep straw and chaff moving on the screen and so that the return elevator does not become overloaded.

"4. Shut off all of the wind on the recleaning fan. Although we did not do it, I believe the best method would be to take the blades completely off this fan. We had the best luck in threshing the seed when there was almost no wind striking the cleaning screens.

"5. Raise the back of the cleaning screen so that it runs almost level with very little slope to the rear. In threshing, this screen should be completely loaded most of the time for best results. We found that if a man kept the seed evenly distributed over this screen with a stick while the machine was in operation, it helped considerably.

Not Much Difficulty in Threshing

August 31, 1936

"We find it rather easy to thresh crested wheat grass. Have used two rows of concave teeth in the cylinder, open the chaffer screen about half, but do not open the lower screen in the separator any more than necessary. By keeping it fairly well closed, not so much short broken straw goes in the sack. Find quite a lot of wind can be used also, as the seed is fairly heavy and does not blow over badly. With the hulls some very light seeds go over in the wind, but as these are too light to be of any value, we blow just enough so the seed in the sack is rather heavy.

"The separator should run at normal speed, and after a very little experience a nice job can be done.

(Signed) H. L. WAGNER & SON

Summerville (Union County)"

"6. The best type of cleaning screen I have yet seen is a lip screen of the same size used for wheat, although the ordinary round-hole wheat screen is satisfactory. We did not change the shoe screen in any case, although a smaller screen than is used for wheat might be better.

"In combining, it is important that the reel be run at the right speed and that the sickle guards be in the best of condition."

Cleaning the Seed

If the seed is not too dirty, an ordinary fanning mill can be used for cleaning by feeding the seed slowly and adjusting the wind correctly. A cleaner of the Carter disk type is said to work well.* An oat kicker is satisfactory on most lots, but the small size is slow and tedious.

Uses of Crested Wheat Grass

Many wheat or rye growers find that they have a liability when they own land which does not pay to plow because of blowing, washing, low yield, small fields, steepness, inaccessibility, or rock. If they stop farming it, the land is soon covered by weeds and delinquent taxes. If they farm it, the costs are as large as the returns. In crested wheat grass, we have for the first time a crop adapted to this kind of land.

For wheat or rye
land pasture.

Over most of Eastern Oregon, from 30 to 50 acres are now required to support one steer for six months on native pasture. No exact figures are available on the carrying capacity of crested wheat grass pasture in Oregon. In the Judith Basin in Montana† where the grass yields about a ton of hay per acre, slightly more than four acres of crested wheat grass are required for one animal for six months. In parts of Oregon where the yield is as high, probably that same acreage would suffice, but in much of the area adapted to the grass the rainfall is such that only half a ton of hay could be obtained, and probably eight to ten acres or more will be needed per animal.

Wheat growers must not expect too much. Although this grass is outstanding, the cash returns from pasturing it can be expected to be far under the cash income from wheat growing—even on

*Crested Wheat Grass. University of Saskatchewan, Agricultural Extension Bulletin 54.

†Crested Wheatgrass as Compared with Bromegrass, Slender Wheatgrass, and Other Hay and Pasture Crops for the Northern Great Plains. United States Department of Agriculture, Technical Bulletin 307.

poor land. The cash expense is of course less, but land in grass pasture is in general worth less than land in wheat. From an income standpoint crested wheat grass should be compared with good bunch grass, not good wheat.

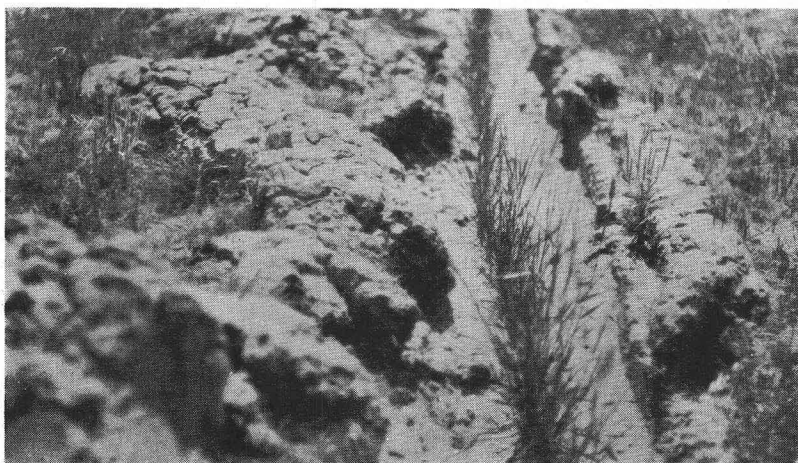
Soil scientists have long pointed out that it is not possible to grow one crop on land indefinitely, and rotation is the key to good farm practice in most communities. So far, the Columbia Basin farming system has ignored this. Many farmers have wanted to rotate but had nothing to rotate with wheat. It is possible that in time the accepted system of farming in the area will be to seed to crested wheat grass mixed with a little alfalfa, leave for a period of years, then plow and put back to wheat.

As a rotation crop
with wheat.

Although the grass is primarily a pasture grass, it makes good hay. In Eastern Oregon hundreds of stockmen grow rye hay.

For hay.

Yields are often low; near failures are frequent; plowing, seeding, etc., are expensive; and it is frequently necessary to buy seed. Much of this expense could be lessened by planting crested wheat grass for hay. On dry land at low elevations it should be planted in rows for hay. In the better yielding sections solid seedings are better.

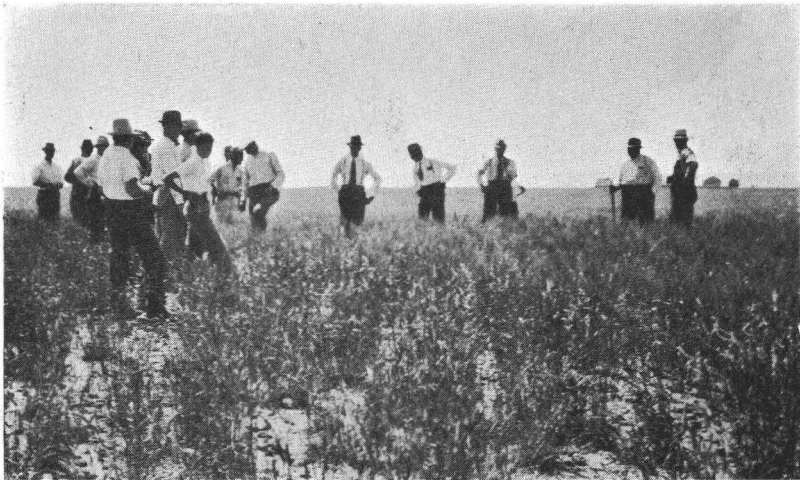


Grass fall seeded in furrow. Hynds Bros. (Morrow County).

Oregon has many thousands of acres of irrigated lands which are not irrigated in those years when the water does not choose to run. There are other thousands of acres not now irrigated which could be covered once with early-spring or late-winter run-off water. An acreage of crested wheat grass hay on such farms would be in the nature of crop insurance.

Much alfalfa is invaded by grass. By seeding a few pounds of crested wheat grass at the time the alfalfa is planted, the downy brome grass can be kept out, the danger of bloat reduced, and the life of the stand lengthened. Other grasses, such as meadow fescue, may be better for this purpose where irrigation water is plentiful, but in the drier locations crested wheat grass will fill the need. Ladak alfalfa should be used in these areas short of water.

The bunch grass sagebrush ranges of Oregon amount to about 30,000,000 acres, making up 50 per cent of the land area of the state. Many of these acres have good grass and are as productive as the moisture will permit. Others are badly depleted and offer the animal looking for food only a starvation ration of weeds and sagebrush. On others, the sage also is killed, and the downy brome grass has



Gilliam County farmers on field tour inspecting L. W. Childs crested wheat on Shutler Flats, June 21, 1936. Seeded with grain drill seven inches apart, spring of 1934. Seed crop 50 pounds per acre cut in 1935. Spring-toothed in spring 1936; about 125 pounds per acre seed cut in 1936. Soil more than six feet deep, rainfall eight or nine inches. Six-acre field. In center of area which blew badly in the spring of 1936.

moved in and taken complete possession. Probably that yields as much in total tonnage as any kind of grass which can be grown, but unfortunately it is useful only in the early spring and again in the late fall or winter after the barbed seeds have fallen and the plant has been softened by the winter rains.

A Good Stand in Downy Brome Grass

"The procedure we followed in seeding crested wheat grass in cheat grass sod was as follows:

"The time of seeding was at Thanksgiving. The weather was quite damp and the soil wet. The new growth of the cheat grass was well started, having leaves about two inches long and thickly set. There was very little old grass to contend with as it had been pastured closely earlier in the season.

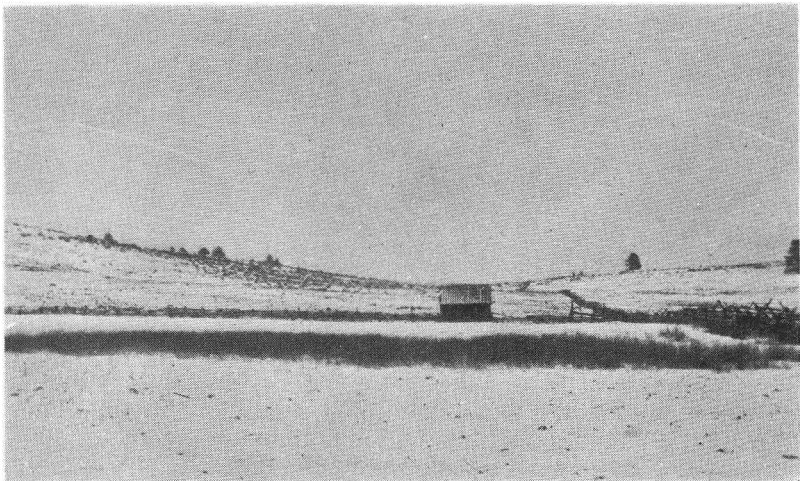
"The drill was set with sufficient spring pressure on the hoes to cut a furrow or trench about an inch and a half deep. We arranged a tin plate in the bottom end of each of the hoes so as to focus the seed through a smaller opening just under the points of the hoes in order that the seed might be concentrated into the narrow furrow and lodge in close contact with the smooth bottom and sides of the trench rather than be scattered more or less in the grass at the sides of the furrow. Some of the dirt fell back into the furrow behind the hoe making a rather soddy covering for the seed, but most of it was turned out in tough strings of sod a foot or more in length that remained out leaving the seed with very little or no cover. The weather remained wet into the winter.

"The amount of seed used was about 12 pounds per acre—seeded with a common grain drill with hoes seven inches apart.

"During the following year, although not pastured, the crested wheat did not appear to amount to much and the cheat grass seemed to have the better of it. This, which is the third year, has reversed the case. The crested wheat seems to have choked the cheat grass to the extent of causing the cheat to mature very close to the ground and dry up very early, while the crested wheat remained green well into the summer.

(Signed) WM. H. STEEN

Milton (Umatilla County)"



Crested wheat, Fox Valley, 1933. The bare ground in the foreground was seeded to slender wheat at the same time that the crested wheat was planted; a good stand was obtained but it died within two years. The crested wheat is still going strong.

People with this type of range are therefore anxious to replace this downy brome grass with a good stand of more useful grass, but where this has been tried, the results have not been encouraging. It is nearly impossible to get any one plant to start in a heavy stand of other kinds of plants. There have been many failures, but Will Steen, of Milton, has succeeded. He now has a fine stand of crested wheat grass on land once entirely occupied by downy brome grass.

If the character of the land is such that furrows can be plowed from 3 to 10 feet apart in the late fall, the grass can be seeded in these furrows and on the loose dirt thrown out, and the chances for getting a stand are good. The snows tend to blow into the furrows and the rain and melting snow run into them, thus providing the seedlings with a chance to get established and compete with the surrounding vegetation.

Furrows of this kind *must* follow the contours of any hillside, otherwise the melting snows will run down and wash gullies, which leave the range in far worse condition than before.

If range land, even after regrassing, is worth only \$3.00 or \$4.00 per acre, the owner can not afford to pay perhaps twice that much to improve it. So if anyone plans to seed grass on the range, his only hope is to grow a few acres of the grass in a seed plot,

harvest the seed, and thereby confine the cash expense to amounts within reason. Several Oregon range men are following this policy.

On some ranges, there are many open spots around water, bedding places, feed yards, etc., where there is little or no vegetation. Such areas can be seeded to the grass very easily, either broadcasting it by hand and brushing or harrowing lightly, or by using a grain drill. Occasionally a range has so little vegetation that stands can be obtained by seeding with no preparation.

If a light stand is secured on range land and the range is thereafter handled so that the grass can seed every year, or at least on alternate years, it will spread gradually and the range will improve remarkably in five years' time. If, however, the range in the future is to be handled in the same way that it was being handled when the native bunch grass went out, all reseeding efforts will be time and money wasted. Crested wheat grass will stand more abuse than the native bunch grass but it must get up high enough occasionally to look a cow in the face.

Grass Stands Grazing in Baker County

"I drilled my seed with a Superior drill through the regular wheat opening, indicator notch No. 5, as I thought the seed might not be very clean, using about 12 pounds per acre. I think the No. 4 notch on old style Superior drill using clean seed would be right for 10 pounds of seed.

"Crested wheat grass has proved very hardy on my ranch. I think fall sowing would be best, but have sowed all of mine in early spring. Freezing doesn't seem to hurt it. I believe this grass will prove satisfactory for pasture. I have 20 acres seeded.

"It is hard to kill out, as I have given a small tract a hard test from the start, pasturing it at all times, and it is still growing.

"Have sowed some in my sagebrush pasture for trial. It seems to be all right.

(Signed) L. S. WIRTH

Baker (Baker County)"

The dense root system of crested wheat grass makes it ideal for controlling either wind or water erosion. One blow patch on the farm of Walter Holt at Pendleton has been completely grassed over. This area of about one acre had blown so long that nothing was left but the familiar white chalk into which one sank several inches at every step. After three years of the grass, this blow has been stopped completely. On the Branch Station at Moro a steep hillside, on which considerable damage from run-off was evident nearly every year, was planted to crested wheat grass in the spring of 1922. Since then this hillside has been used for pasture and the erosion practically eliminated.

For erosion control.

A recent survey shows that there are more than 30,000 acres of perennial weeds in Eastern Oregon. One of the cheapest ways to control weeds is to seed the land to a permanent grass crop. Experience in the state of Washington, for example, as reported by C. Edwin Hill of the Soil Conservation Service, indicates that grass will hold morning glories in check. Mr. Hill says:

For weed control.

"While in Waterville a year ago, I inspected two areas which were formerly badly infested with morning glory and which were seeded to crested wheat grass. One of these seedings was on the Clifford Jones farm. The other was in the town of Waterville in the yard of the residence of Josh Barnes.

"The seeding on the Jones farm was made in 1923 or 1924 and on the Barnes place about three years later. When I examined these seedings in June last year, I could find no morning glory in the seedings on the Clifford Jones farm and only a few scattered plants in the Barnes seeding. These results would indicate that under extreme dry conditions, crested wheat grass is very effective in either killing or checking the growth of wild morning glory. This may be explained by the fact that the grass survives under extreme dry conditions and makes a quick recovery after the fall rains. As the morning glory does not start growth until quite late in the spring, it is not able to compete with the early growing grass which has the advantage of both moisture and plant food, both of which are largely exhausted at the time morning glory starts its growth in the spring.

"These seedings did not look very promising for the first two or three years."

In Canada, Dr. L. E. Kirk reports* that many farmers are using crested wheat grass for lawns where water for sprinkling is not available. The University of Saskatchewan developed the Fairway strain for this purpose. The dust nuisance around many Eastern Oregon homes

For lawns.

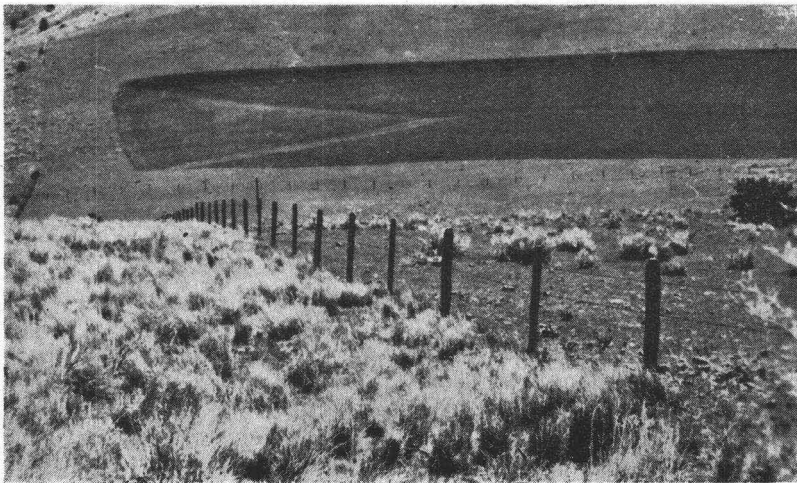
*Crested Wheat Grass. University of Saskatchewan, Agricultural Extension Bulletin 54.

can be eliminated in part with the grass, thereby reducing wear and tear on the tempers of the housekeepers. When seeded for a lawn, it should be at the rate of at least 50 pounds per acre.

Cut-over and burned-over forest lands in Eastern Oregon are often a liability to the owners and to the state. If nothing is done, these lands usually come up to brush and bull pine thickets, thus rendering them unfit for either grazing or forest. The brushy areas interspersed with pine thickets make ideal kindling for the next fire. After fire runs over them the second time, most of the forest litter is burned, young seedlings are destroyed, and reforestation is delayed for many years. Such areas could well be seeded to crested wheat grass immediately after the first burn or after cutting and burning. Grazing would be increased many fold, the brush and thickets would be held down, fire hazards reduced, and reforesting would occur much faster.

How to Maintain Stands of Grass

It has been remarked that anyone can get money, but it takes a wise man to keep it. Grass fits nicely with money in the adage. Not that anyone wants to kill his grass, but the killing happens so often that conservationists sometimes wrongly assume it to be a



On left, John Maidment sheep range near Lonerock, Gilliam County. Used continuously by present owner for 40 years with no deterioration in stand of bunch grass. Over 4,000 acres in this range. On right is range mostly in downy brome grass.



Crested wheat grass, Fox Valley, Grant County, 1933. A corner of a grass nursery where most other grasses died within three years. Homer Halstead ranch.

necessary part of the livestock business. A good stand of grass on privately owned ranges might do more than anything else to check the propaganda against use of public lands for livestock.

Everyone knows that complete rest will restore grass, but naturally, a man must harvest his crop and if his only crop is grass and that is his sole source of income, the grass will be used. Complete rest is usually impossible. A proper understanding of the growth habits of grass may make it possible for a man to disprove the old adage that one cannot have his cake and eat it too.

Most long-lived dry-land plants have two definite growth periods each summer. During the spring months they are using the food stored underground the previous season. During the late spring and early summer they are storing food—building up a reserve which can keep them going in case of disaster. This invisible reserve is far more important than the top growth. It can only accumulate through the action of the leaves. Aided by sunlight, they manufacture food from the air, the moisture, and the soil, and this manufactured food is stored away—not for a rainy day, but for a dry one. The following spring the early growth comes largely from the stored food in the crown and roots.*

That is the natural course of events. Now consider what happens when the sequence is broken. An animal eats the early growth, short and clean, and the stored food promptly sends up

**Grazing Periods and Forage Production on the National Forests.* United States Department of Agriculture, Bulletin 1405.

more. But suppose this is eaten also and perhaps a third growth. By that time, the dry season is on and all growth ceases. Naturally, there is no storing of food for the next season. So the following year, growth starts late and is short. If the same treatment is given the grass the second year, it becomes very sparse the third year; and if eaten again as fast as it appears, the plant will usually die by the third winter. A steer wintered mostly on scenery, with a barbed wire fence for shelter, will die in a spring storm which is refreshing to a strong animal. For that same reason weak grass will die under conditions not at all harmful to a vigorous stand.

The root system of a dry-land bunch grass plant can be likened to a checking account on a bank which can not long stand continued checks with no deposits. Each time the grass is eaten is a check and each time the leaves are allowed to grow six inches high or more, a deposit occurs—a deposit of stored food. A proper balance of checks and deposits will keep the account flourishing indefinitely. Thus, early use of the grass may not be harmful—providing good regrowth is allowed later.

If the native bunch grass is handled so that the food resources are exhausted, the grass will die. Downy brome grass doesn't come in and drive out bunch grass. Not even sagebrush can do that. If the grass is allowed to come to maturity each year, it will pretty effectually drive out all kinds of weeds and other grasses—that is why bunch grass grew over so wide an area originally. But



The "Fairway" selection of crested wheat grass, which has a habit of shorter growth and is finer stemmed. The seed yield (1935) from the plot shown in this picture was 928 pounds recleaned seed per acre. Union Experiment Station.

if grazed so that the plant is weakened the first year, and it has no chance to recover thereafter, then its disappearance is inevitable.

Crested wheat grass is in most respects like native bunch grass. One who plants it for pasture should make up his mind to rest it for a season occasionally or else allow some regrowth every year. This can be done by having several pastures which are grazed alternately, giving each a complete rest, or by using one for early pasture one year and late pasture the next. This naturally involves fencing, accessibility to water, use of additional range and other things which cannot be discussed here.

The whole point is that there is no particular object in going to the expense involved in getting a good stand of this grass and then promptly ruining it by proceeding to violate the laws of nature. If one recognizes the nature of dry land bunch grass and can adjust his grazing so as to work with, rather than against nature, there is no reason, so far as known, why a stand of crested wheat grass should not last indefinitely. Certainly some of the bunch grass ranges where the grass is allowed to mature have shown no deterioration in fifty years of use. They still show the stirrup-high stands which the early settlers talk about. Grazing after maturity seems to do little if any damage and it may even do some good in tramping seed into the ground.

SUMMARY

1. In the Columbia River Basin low wheat prices, eroding soil, and governmental agencies have combined to create an interest in grass among wheat farmers.

2. In the livestock counties deteriorating ranges, both public and private, have focused attention upon the need for grass.

3. The branch experiment stations and the county agents in Eastern Oregon have conducted trials with many grass varieties. Thus far, crested wheat grass, an introduction from Siberia, has been the most promising variety.

4. Crested wheat grass is a perennial bunch grass with habits of growth quite similar to the native blue bunch wheat grass of Eastern Oregon. It is somewhat more drought resistant, begins growth earlier in the spring, starts growth more quickly after the fall rains, and produces much more seed than blue bunch wheat grass. Crested wheat grass, moreover, can be cut and threshed for seed with the machinery used for harvesting grain.

5. Trials by farmers in every Eastern Oregon county indicate that crested wheat grass is adapted to a wide range of soil and climatic conditions. Cool weather suits it best, and it shows most promise at locations above 2,500 feet.

6. Crested wheat grass is recommended for growing on land that it does not pay to plow because of blowing, washing, low yield, small fields, steepness, inaccessibility, or rock.

7. Detailed information about methods of planting and harvesting crested wheat grass is given on pages 11 to 28, together with several letters from farmers who have had experience in growing this crop. Suggestions about methods of planting crested wheat grass on range land are given on pages 16 and 17.

8. Uses of crested wheat grass include: pasture on former grain lands and on range lands; a rotation crop with wheat; a hay crop on dry land or partly irrigated land; planting with alfalfa to reduce bloat and keep out needle grass; erosion control; control of noxious weeds; dry-land lawns; planting on burned-over forest land.

9. To maintain a stand, crested wheat grass should not be over-grazed. It should rest for a season occasionally, or some regrowth should be allowed every year. If properly handled, there is no reason why a stand of crested wheat grass should not last indefinitely.



EASTERN OREGON RANGE LANDS

Above: The night camp—typical Forest Service range, Oregon. Note the area around the bed ground bare of vegetation. Such areas can be seeded to crested wheat grass with very little preparation of seed bed.

Photograph by Parker, Baker, Oregon.

Below: Sheep on sagebrush and bunch-grass range, Eastern Oregon.

Photograph by Gifford, Portland.

