Seeding British Columbia Rangelands

Alastair McLean and A.H. Bawtree

Studies show fall-seeded crested wheatgrass can increase forage yields from two to ten times on semiarid ranges of the British Columbia Interior. A disc-seeder-packer combination has been built which is adapted to rugged range conditions. Existing unproductive vegetation is first destroyed by the disc arrangement. The soil is then firmed with a large roller; seed is dropped and pressed into the soil with a second roller. Costs are kept to a minimum by accomplishing all operations in one pass over the land. The limited grassland ranges are essential for early spring and late fall grazing and represent the key to low cost beef production in British Columbia.

Much of the ranching industry of British Columbia depends on strips of grassland along the main river valleys for spring, fall and winter range. Availability of this range can substantially reduce the cost of winter feeding. Most ranches need more grassland range to balance their operation as there is relatively more forested summer range at higher elevations. Much of the available grassland has been overgrazed and is presently producing below maximum forage. Seeding to grass is the only practical way of restoring badly depleted areas and two to 10 times more forage has been obtained. Research has shown that it may take 40 years or more to restore the driest ranges to full productivity by resting only (McLean and Tisdale 1972).

The Research Station at Kamloops has conducted many seeding trials over the past 40 years to determine which grass and legume species are best adapted to our grassland ranges. The wheatgrasses have produced the best results (Fig. 1). Under our driest conditions (about 25 cm precipitation), desert wheatgrass (*Agropyron desertorum*), crested wheatgrass (*A. cristatum*), beardless wheatgrass (Whitmar) (*A. spicatum*), Siberian wheatgrass (*A. sibericum*), and Russian wild ryegrass (*Elymus junceus*) have been the only ones to survive and give good weed control. Siberian and beardless wheatgrasses are not yet licensed in Canada. Summit, Nordan, and Fairway varieties of crested wheatgrass have all been successful. Russian wild rye is hard to establish and has a much lower herbage yield than crested wheatgrass under our conditions but has higher protein levels in the summer and early fall. Of the legumes evaluated, Siberian alfalfa (*Medicago falcata*) is the only one to survive. On the wetter grasslands (more than 30 cm precipitation) a number of species can be added, such as smooth bromegrass (*Bromus inermis*), intermediate wheatgrass (*Agropyron intermedium*), big bluegrass (*Poa ampla*), and legumes such as alfalfa (especially Drylander and Roamer), sainfoin, and sweet clover.

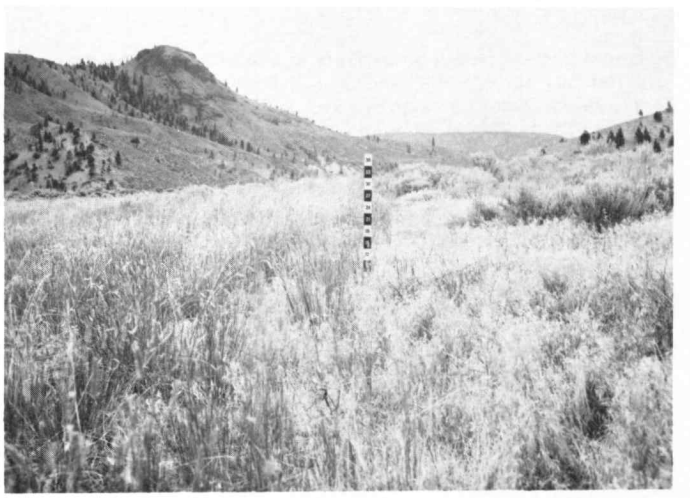

Fig. 1. *Crested wheatgrass seeding (left) on depleted rangeland dominated by big sagebrush, rabbitbrush and cheatgrass.*

Also, our research has shown that fall is the best time to seed grassland ranges. Seeding between late August and mid-October at 5 kg/ha produced good stands whether germination took place in the fall or the following spring. Seeding between early April and mid-May also produced adequate stands but plant populations were about two-thirds those from fall seedings. Seeding in late May and June generally resulted in failure. There didn't appear to be time for seedlings to become established before the onset of summer drought.

Ranges in British Columbia are difficult to cultivate because of their plant cover and the rugged nature of the terrain. The rangelands have mostly undulating to steep terrain that is often gullied, with bedrock close to the surface and gravelly or rocky soil. Dense stands of big sagebrush may interfere with seeding equipment. Low-growing forbs and perennial grasses frequently form a dense mat or sod and are hard to kill. The Research Station conducted an experiment to evaluate the performance of field equipment in establishing crested wheatgrass on dry ranges near Kamloops and to determine what conditions of site and seedbed had to be met. Two well-known principles in range seeding are: elimination of existing perennial species and correct seeding depth. Existing perennials frequently utilize all available moisture before seedlings are able to establish. Grass seed should be buried between 1 and 2 cm to provide the best conditions for germination and seedling establishment. Seedings were made at seven locations in both spring and

Authors are research scientist, Range Research Station, Agriculture Canada, Kamloops, B.C.; and range extension specialist, B.C. Ministry of Agriculture, Kamloops.

Editor's Note: This article was designed as an update for range technicians, range managers, ranchers, and extension people. It should be helpful to those interested in range seeding in Canada and the northern part of the United States.

Fig. 2. *Rangeland disc-seeder developed and used by the British Columbia Ministry of Agriculture.*

fall over 2 years. The standard rangeland drill (discs 30 cm apart), modified rangeland drill (discs 60 cm apart), one-way disc, and tandem disc were compared. The grass was seeded using a seeder on a one-way disc, grain drill, or standard rangeland drill. Packing with a Brillion packer was compared with no packing.

Effectiveness of equipment was strongly influenced by whether the soil was moist or dry. When the soil was dry the discs had a tendency to penetrate deeply and make a soft seedbed.

The necessity of removing existing competition was demonstrated in the greater effectiveness of the one-way and tandem discs compared with the rangeland drills. In the latter treatments, although many seeds germinated, the plants remained stunted. The one-way disc showed limited effectiveness on sloping sites when cultivation was contoured, since the turned sod often fell back into place when the throw was uphill. The one-way disc performed poorly where heavy sod was encountered because of its light weight, while on rocky soil the disc bounced out of the ground after hitting rocks because of its fixed axle.

The use of the grain drill in seeding gave the best depth control, especially in dry soil where there was a tendency for seed to be buried too deeply (> 5 cm). Packing was generally beneficial except in loose, dry seedbeds where the soil tended to pile up in front of the packer.

Of the single-pass treatments, the one-way disc with its attached seeder gave the best result. The best treatment was two passes with the tandem disc followed by seeding with a depth-controlled drill and Brillion packer. This combination controlled existing vegetation well, particularly big sagebrush. Seed was placed at 1 to 2 cm depth and the seedbed firmed following seeding to ensure good soil-seed contact. The three separate operations (tillage, seeding, and packing) comprising this treatment are difficult to justify economically, however, and damage to this light-weight equipment was high. None of the machines tested was entirely satisfactory. The importance of individual suspension of discs and seeding depth control was demonstrated. The trials showed that equipment needed to seed ranges in British Columbia would have to till the undulating ground thoroughly, place the seed accurately and cover it for maximum soil-seed contact and moisture retention. Ideally the seeder should do all this in one pass over the range to keep costs down.

The Research Station and the Engineering Branch of the British Columbia Ministry of Agriculture have cooperated to develop a machine that meets the above requirements. It consists of two basic units, a flexible heavy-duty double offset disc for control of vegetation and soil tillage and a free-floating packer-seeder to place the seed accurately and compact the soil (Fig. 2). The two units are pulled in tandem for a once-over operation.

The unique feature of the offset disc is the floating gang design. Each 3.6-m gang is made up of four individually suspended sub-gangs. The sub-gangs are controlled and loaded by a hydraulically operated cylinder (McLean et al. 1978).

The seeder-packer consists of two sets of corrugated rollers in tandem. Both front and rear roller assemblies are made up of four independently suspended packer sections. Seed is broadcast betwen the rollers from a standard seed box. The second set of corrugated rollers is offset to split the shallow ridges formed by the front rollers, cover the seed and firm the soil for maximum soil-seed contact. On gently sloping terrain, a 140 hp crawler tractor has adequate power to propel the 9,072 kg disc and 6,350 kg seeder-packer. When severe slopes are encountered, a late-model 200 hp or equivalent crawler tractor is required. Under good conditions it is possible to seed up to 1.6 ha/hr. The 3.6 m machine is too large for easy transport and maneuvering and has a heavy power requirement. A 2.4 m model has been built that can be handled with average ranch crawler tractors. This model is now under test.

Seeding dryland ranges can substantially increase the number of animals carried per hectare, weight gains, and total beef produced (Fig. 3).

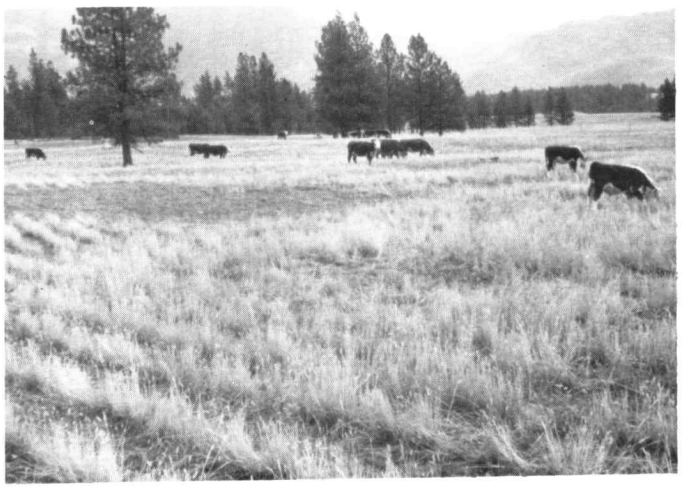

Fig. 3. *Cattle on range seeded to crested wheatgrass.*

A grazing trial was undertaken to determine how much the carrying capacity of dry sagebrush grassland could be improved by seeding and grazing crested wheatgrass. A site was chosen on gravelly soil where the precipitation averaged less than 25 cm. The range was in poor condition and dominated by big sagebrush, with a sparse cover of dwarf pussytoes, pasture sage, and needleandthread (*Stipa comata*).

The annual forage yield from clipped plots was 34 to 45 kg/ha.

The area was mowed with a large rotary mower to remove the big sagebrush. It was then seeded to crested wheatgrass in the spring, at 3 kg/ha using a rangeland drill. Seedlings were not apparent until the following year and the forage was not grazed until the third year after seeding. The fields were then grazed from mid-April to mid-May and again from late November to late December. We found that when the fields were heavily grazed up to mid-May, regrowth was minimal and fall growth was limited. The best grass use and cattle distribution on crested wheatgrass was obtained when the fields were heavily grazed for short periods of time. Gains on yearling steers were high during the spring grazing periods while the grass was growing rapidly and high in digestible nutrients (crude protein values varied from about 23 to 12% over the grazing period). Rates of gain varied from 1 to 2 kg/day depending to a great extent upon the nutrient level at which the cattle had been wintered. Seeding increased the carrying capacity of this dry range from about 8 to 3 ha/animal unit month or nearly three times the unimproved range.

The total forage produced from the above fields based on clipped plots ranged between 440 to 620 kg/ha and averaged 500 kg/ha total. This represented an increase of about six times over the adjacent depleted native range. However, direct comparisons cannot be made with the recorded carrying capacity because the clipped plots were not necessarily representative of the field as a whole since no allowance was made for rocky outcrops, weedy patches, and distance from water. Similar increases in forage yield were obtained by the B.C. Ministry of Agriculture on plots clipped on a demonstration seeding about 3 km away.

The cost of rehabilitation is high and results are not guaranteed and not even likely unless the project is soundly based. The need for careful planning and execution of a seeding program was apparent from our studies. The rewards are considerable, however, both from increased productivity and in a well-balanced grazing operation.

Literature Cited

McLean, A., and E.W. Tisdale. 1972. Recovery rate of depleted range sites under protection from grazing. J. Range Manage. 25: 178-184.

McLean, A., T. Windt, A. Bawtree, and D. Waldern. 1978. Improved rangeland seeding equipment. Canada Agr. 23(3): 14-15.

Merrill's Marauders!!

President-Elect John "Chip" Merrill is vitally interested in receiving *ideas* and *suggestions* from the members of SRM concerning *programs* and *activities* of the Society. He is interested in your comments concerning *current activities* and how to solve *existing problems* but also on *innovative* and *creative* new programs and activities in which the Society could and should become involved.

The 1981 President of SRM also wants the *best possible* candidates for Committee appointment—those who are willing to *work* hard to achieve the goals of the Society and devote a lot of time to the day-to-day Committee activities.

Please use the space below to communicate your ideas to "Chip" and list committees on which you will be willing to serve in 1981 and beyond. Please cut the sheet at the perforation and send to:

John L. Merrill
Route 1, Box 54
Crowley, Texas 76036

Comments on current activities and programs; how can we do the job better in your opinion?

_____

_____

_____

Ideas for new programs and activities (List in priority):

_____

_____

_____

Committees on which you would like to serve (List in priority). See April *Rangelands* for a list of committees:

1 _____ 4 _____
2 _____ 5 _____
3 _____ 6 _____

Name: _____

Address: _____

City _____ State _____ Zip _____