History of Crested Wheatgrass in the Intermountain Area

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ABSTRACT: The improvement of degraded sagebrush (Artemisia) rangelands in the Intermountain area was severely restricted during the first part of this century by lack of adapted plant material. Crested wheatgrass (Agropyron cristatum and A. desertorum) became available during the 1930's. Techniques and equipment for seeding were developed during the 1940's. The halogeton (Halogeton glomeratus) control programs gave great impetus to the seeding of crested wheatgrass on public lands during the 1950's. The established stands of crested wheatgrass provide an extremely valuable grazing resource in the Intermountain area.

INTRODUCTION

The need for seeding of depleted big sagebrush (Artemisia tridentata) rangelands was recognized long before the technology for seeding was available. The editor of the Carson City, Nevada, Morning Appeal must have felt especially clairvoyant on an early December day in 1886 as he greeted his readers with a stirring editorial offering an answer to Nevada's declining range productivity. The editor's suggestion was to have the state appropriate funds for research to determine how to reseed grasses on the depleted sagebrush rangelands of Nevada (Young and McKenzie 1982).

By the beginning of the 20th century both P.B. Kennedy of the University of Nevada and David Griffiths of the U.S. Department of Agriculture were calling for seeding to restore the productivity of degraded sagebrush rangelands (Kennedy and Doten 1901, Griffiths 1902). These scientifically trained botanists called for the collection of seeds from native perennial grasses for use in revegetating rangelands. What could be more adapted to the sagebrush environment than grasses that had evolved in that environment?

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Sometime after the turn of the century, there was a dramatic change in many of the sagebrush/grass plant communities of the Intermountain region. A series of alien annual weeds invaded the void in the vegetation created by overutilization of the native herbaceous species. Such weeds as Russian thistle (Salsola iberica), tansy mustard (Descurainia pinnata), tumble mustard (Sisymbrium altissimum) and cheatgrass (Bromus tectorum) spread in successive waves across the Intermountain area. The invasion and establishment of these aliens revolutionized plant succession in the degraded sagebrush/grass communities. Seedings of many of the native perennial herbaceous species could not compete with the alien annuals (Piemeisel 1951, Young et al. 1972, Yenson 1981). Range managers found they did not have plant materials that could be established on the sagebrush rangelands.

Early in the 20th century, the first range scientist working for the U.S. Forest Service, A. W. Sampson, experimented with methods of reseeding depleted rangelands located in the national forests. The early seeding attempts were summarized by Jardine and Anderson (1919): "The results presented in Bulletin 4 (Sampson 1913) as well as the results of investigations since it was issued, indicate that the expense of seeding rangelands to cultivate species is warranted only on mountain meadows and other areas of minor extent 500 feet and more below true timberline and having favorable soil and moisture conditions."

Obviously, the seeding of alpine meadows on national forests was physically and environmentally a long way from rehabilitating vast expanses of degraded sagebrush rangelands in semiarid valleys on the public domain that was open to homesteading. In Nevada, for example, where millions of acres of degraded sagebrush rangeland existed, the vacant public land constituted 71 percent of the state's total land area (Buckman 1938). On June 28, 1934, the Taylor Grazing Act was finally passed by Congress after years of delay. On November 26th of that year, President Franklin D. Roosevelt issued an executive order withdrawing 173 million acres of public lands in 12 western states from homesteading entry.

SEEDING DURING THE 1930'S

The impetus for reseeding degraded sagebrush rangeland came from two sources during the 1930's. First, the long-established research stations of the Forest Service, especially the Intermountain Forest and Range Experiment Station, developed techniques for seeding sagebrush rangelands. Second, the infant Grazing Service of the U. S. Department of the Interior began to instigate range improvement projects.

During the late 1930's, a surplus of manpower was available through such programs as the Civilian Conservation Corps (CCC) for improvement projects on public lands. For the first time the federal government was willing to devote considerable amounts of money toward improving wildlands. The CCC crews were employed on a variety of projects, from building roads and trails to attempting to control the destructive outbreaks of Mormon crickets (Anabrus simplex) (Young 1978). Use of labor intensive methods for rehabilitation of degraded rangelands was defeated by the accumulations of woody biomass and the vastness of the sagebrush landscapes. A picture of futility was CCC boys pushing hand garden planters through mature stands of big sagebrush (Anon. 1941). Their efforts were futile because (a) the biological competition from the shrub was not reduced, (b) the physical restrictions of handseeders imposed by the shrubs, and (c) the limited area that could be seeded, even with large crews.

Essentially, the range rehabilitators were faced with the same problems that had plagued homesteaders. The successful homesteader within the sagebrush zone had sometimes overcome the shrub community by developing irrigation systems and flooding potential agronomic fields. The native desert shrubs could not stand prolonged flooding. Thousands of homesteads were cleared by hand grubbing, dragging with rails or timbers, or a combination of several such treatments. The range improvers did not have the option of flooding, and rather than a portion of 160 acres, they had millions of acres of sagebrush-dominated rangeland to clear.

The para-military CCC approached these problems with a militaristic attitude. More troops were futile, but the battle against sagebrush would be more equal if suitable equipment could be substituted for manpower. The logical source of equipment was agriculture, but generally agronomic tillage implements proved too fragile and time consuming to operate on sagebrush rangelands. Borrowing from the techniques used by developers of irrigation tracts, the CCC experimented with dragging heavy railraod rails behind tractors in an attempt to knock down or uproot mature, nonsprouting sagebrush plants.

Several types of rails were developed for knocking down big sagebrush plants. These include the Monte Cristo rail, named for the Monte Cristo Ranger District on the Wasatch National Forest near Ogden, Utah; the Olsen rail, named for a sheep and wheat rancher who developed and extensively used the rail in the Columbia Basin north of Hanford, Washington; and the Supp rail, developed by the Supp Brothers to clear land in the defunct irrigation project at Metropolis, Nevada (Pechanec et al. 1944, Robertson 1944).

First Seedings of Crested Wheatgrass

Standard crested wheatgrass (Agropyron desertorum) and Fairway crested wheatgrass (Agropyron cristatum) provided the vital ingredient of adapted plant material that brought success to range seeding in the Intermountain area. Crested wheatgrass had undergone a lot of development in Russia and on the Great Plains of the United States and Canada before it was widely used (see Lorenz this volume).

The first known range seeding of crested wheatgrass in the Intermountain area occurred in 1932 on Herman Winter's farm near American Falls, Idaho and at the U.S. Department of Agriculture Sheep Experiment Station near Dubois, Idaho (Hull and Klomp 1966). In 1936, the Rural Resettlement Administration began drilling the first of 57,000 acres of crested wheatgrass on land utilization projects in Curlew and Black Pine Valleys in Oneida County, Idaho. The Crooked River National Grasslands were another center of successful seeding establishment. Crews of local farmers were assembled in 1936 under the Emergency Relief Act, as administered by the Rural Resettlement Administration, to begin seeding abandoned cropland. The farmers brought their own teams and old farm tractors to pull disks, moldboard plows, and grain drills. Various grass species were seeded before crested wheatgrass became more or less the standard species (Young and McKenzie 1982).

Private ranchers also experimented with seeding of sagebrush rangelands. In 1940 there were three successful seedings of crested wheatgrass on rangelands in Nevada and they all were located on private ranches (Young and McKenzie 1982). George Stewart described the first crested wheatgrass seeding as an oasis of perennial herbaceous vegetation in oceans of denuded rangeland (Stewart 1938).

During World War II, pressure was applied to the U.S. Forest Service by wool and meat processors to allow increased numbers of cattle and sheep to graze in national forests. Remembering the disastrous results of such increased allocations during World War I, the Forest Service resisted such efforts, but pointed out that livestock production could be increased if degraded areas were improved through seeding. With the support of the agricultural portions of the War Productions Board, the Forest Service submitted supplemental budget requests for research on range seeding. With the support of livestock producers, funding was greatly increased by Congress (Chapline 1978). The Forest Service seeded about 20,000 acres in this pilot program.

As a part of the Forest Service range improvement program, Joseph Robertson was assigned by the Intermountain Forest and Range Experiment Station during the early 1940's to assess seedable sites on national forests in Nevada and Wyoming. In the Ruby Mountains of Nevada, Robertson suggested that rugged topography, rocky soils, and general condition of the plant communities made seeding unfeasible and undesirable. Robertson suggested that the seeding of degraded sagebrush ranges located off the national forests would benefit the

higher ranges by permitting a later turnout date for livestock in the spring. His suggestion was accepted and 820 acres were seeded in the Ruby Valley near Arthur. For many years the seeded area had been a dangerous spring range for cattle because of a poisonous plant, low larkspur (Delphinium bicolor). The area's grazing capacity was rated at 16 acres per animal unit month (AUM). The seeded area was a mixture of private and public lands administered by the USDI Bureau of Land Management. After two years rest the seeding was grazed for three weeks each spring by 400 cows and calves that normally would have been turned out on the national forests. This example of how the seeding money was spent by the Forest Service illustrates the potential of range improvement to alleviate management problems while increasing red meat production. This and other pilot testing projects during the war helped dispel the prevailing attitude that sagebrush ranges could not be seeded (Young and McKenzie 1982).

As a result of the pilot seeding program, the Intermountain Forest and Range Experiment Station issued three landmark bulletins on rangeland seeding. The first concerned seeding of Utah rangelands (Plummer et al. 1943); the second Idaho rangelands (Hull and Pearse 1943); and the third Nevada rangelands (Robertson and Pearse 1943).

PROBLEMS WITH SEEDING EQUIPMENT

The Forest Service claimed 90 percent successful establishment with the pilot seeding program, but equipment breakage was a major problem. A conference was held in Utah in 1945, attended by western Forest Service administrators and researchers, to consider the general subject of range seeding. A lack of effective and suitable equipment was determined to be one of the major stumbling blocks in the way of successful seeding. This led directly to the formation of the Range Seeding Equipment Committee. The first official meeting was held in Portland, Oregon in December 1946. The second meeting followed in Ogden, Utah in 1947. The list of those attending included a blend of old-time range scientists such as George Stewart and W. R. Chapline, and such younger scientists as A. C. Hull, Jr. and Joseph F. Pechanec. Pechanec was elected chairman of the committee. He was beginning his career as a scientist at this time and was to have a great deal to do with the development of special range improvement equipment both as a scientist and a research administrator (Anon. 1974).

Other land management agencies with similar problems eventually joined the Forest Service to form a federal interagency committee for range seeding equipment. The Bureau of Land Management joined the committee in 1949, followed by the USDI Bureau of Indian Affairs, and the USDA Soil Conservation Service. In 1954, after a portion of the range research program was transferred from the Forest Service to the USDA Agricultural Research Service, an ARS scientist joined the committee.

Development of Rangeland Plow

As previously noted, most of the wheatgrass seedings during the 1930's in the Intermountain area were carried out on abandoned cropland. If sagebrush ranges were to successfully be seeded, mechanical means of brush control had to be developed. Among the first projects undertaken by the Range Seeding Equipment Committee was an evaluation of the rail drags and pipe harrows used in brush control. Pipe harrows were self-cleaning harrows for tillage on very rocky sites. Both implements were relatively effective on old growth plants which could be easily uprooted, but neither controlled supple young plants (Anon. 1974).

The implement that did the best job of controlling big sagebrush was the wheatland disk plow. The wheatland plows were subject to a great deal of breakage of castings, disks, and even the frame if they were used on rocky sites. Use of this plow required continued maintenance. But despite its drawbacks, many early seedings including a portion of the Ruby Valley project were established with wheatland plows with seeders attached (Young and Mckenzie 1982).

After his experiment with wheatland plows, J. H. Robertson was interested in the development of a plow for rangelands. He noted in the proceedings of the 1939 World Wheat Congress a report on an Australian stump-jump plow. The plow was designed with each pair of disks independently suspended on spring-loaded arms so that when an obstruction was met the disk rode over the blockage rather than breaking. Robertson called this plow to the attention of his colleagues and a plow known as the Sungeneral or Australian stump-jump plow was imported from H. V. McKay, Massey Harris Ltd. of Sunshine, Australia (Young and McKenzie 1982).

The plow was tested March 17, 1946 on an area south of Boise, Idaho. A portion of this site had lava rocks up to 16 inches in diameter on the soil surface. After the initial test, the plow was taken to an area near Smith Prairie in Boise National Forest where 305 rocky, steep acres were plowed. The site had previously caused excessive breakage of a wheatland plow. Extensive testing in the Pacific Northwest followed. The stump-jump plow proved to be too weak and easily damaged (Pechanec and Hull 1947).

From this prototype plow imported from Australia, the Range Seeding Equipment Committee and the Forest Service Equipment Laboratory at Portland, Oregon in 1947 and 1948 developed the plow which became known as the brushland plow. The engineering work was done by Ted Flynn with assistance from Tom Caldwell and with the approval of J. F. Pechanec (Young and McKenzie 1982).

Land managers now had an implement capable of attacking dense stands of big sagebrush. The plow imported from Australia was relatively inexpensive at a cost of $413 f.o.b. Sunshine, Australia in 1946, and weighed 3,000 pounds (Anon. 1974). The brushland plow produced by the Equipment Committee's efforts was a much more substantial implement weighing 6,000 pounds. The brushland plow was considerably more expensive and the cost has continued to rise, reaching $25,000 in 1979. This underscores the capital requirements for range improvements.

The brushland plow is important in the story of the development of the rangeland drill because a brush control implement had to be developed first, and because the independent suspension of the disks

became the pattern for the development of furrow openers on the drill.

Development of Rangeland Drill

Grain drills designed for farms had proven even less adapted to sagebrush ranges than plows. In southern Idaho and central Oregon, there were considerable acreage of abandoned cropland that could be seeded to crested wheatgrass by grain drills with few problems. However, the uneven seedbeds with clumps of woody trash produced by the new brushland plows proved to be particularly hard on grain drills. A major problem was breakage caused by the presence of large rocks on the soil surface.

In early summer 1951 Floyd Iverson, a regional range and wildlife officer for the Forest Service, made a routine trip to the Fremont National Forest in southeastern Oregon. During a discussion of the range seeding program on the forest, the forest, range, and wildlife staff officer, John Kucera, mentioned that during an eight-hour working day they were breaking three or four drill arm assemblies. Mr. Iverson suggested the need for someone to develop a drill for rangelands. Kucera immediately said he would attempt such a development if he had the funds. The regional office contributed $700 toward such a project based on Kucera's cost estimate. The drill conversion eventually cost $1,000 with the Fremont National Forest paying the difference (Young and McKenzie 1982).

Development of the first rangeland drill was started in July 1950. The performance goal for the drill was that it could be used anywhere one could drive a small crawler tractor. Up until 1950 most range seeding was done with John Deere-Van Brunt grain drills. The Fremont Forest happened to have a Minneapolis-Moline drill with a heavy frame, so it became the experimental unit. For clearance, 12-inch spoke extenders were welded around the existing wheels. This prompted taunts that the experimenters were building a mechanical porcupine. A new rim was placed around the outside of the spokes. The designers then developed Y yokes to support the disk openers. These openers made the furrow in the seedbed surface into which the seeds were dropped. Determination of the correct angle of the yokes that permitted them to ride up over obstructions was gained by trial and error (Young and McKenzie 1982).

In the fall of 1951 the modified drill was used to seed 750 acres on the Coffee Pot seeding in the Paisley Ranger District of the Fremont Forest. The openers worked adequately, but the frame and tongue had to be strengthened. In early January the designers loaded what they called "our monstrosity" on a railcar for shipment to the Forest Service Equipment Development Laboratory at Arcadia, California where it was to serve as a model for development of an engineered drill (Young and McKenzie 1982).

SEEDING TO SUPPRESS HALOGETON

During the 1950's there was intense pressure on public land range managers to control the poisonous weed halogeton (Halogeton glomeratus) that had been responsible for the deaths of large numbers of sheep. Several prominent range scientists led by L. A. Stoddart of Utah State University had advocated the biological suppression of halogeton by seeding crested wheatgrass. J. H. Robertson had established experiments near Wells, Nevada during the 1940's on an area burned in a wildfire. These experiments had clearly shown that crested wheatgrass could significantly suppress halogeton (Evans et al. 1984).

Committees were formed in the affected states to develop suppression programs for halogeton. Members of the Idaho committee had visited J. H. Robertson's plots at Wells and extolled the virtues of crested wheatgrass in suppressing the poisonous weed. Extensive plantings were made in the Raft River Valley at Idaho to suppress halogeton. These crested wheatgrass plantings became the center of a concerted research effort on crested wheatgrass under the leadership of Lee Sharp of the University of Idaho.

After federal support was assured by passage of the halogeton control bill by Congress in 1952, the Bureau of Land Management carried out extensive seeding programs with crested wheatgrass. A large portion of the crested wheatgrass on public land in states like Nevada was seeded under the halogeton program.

During the 1960's the public land management agencies came under severe pressure from a variety of environmentally concerned groups (Young et al. 1979). One result of these pressures was the virtual discontinuation of range improvement projects and especially the seeding of crested wheatgrass.

CONCLUSION

The "Golden Age" of seeding crested wheatgrass lasted for barely a decade, from the mid 1950's when the equipment and funds became available to conduct the seedings until the mid 1960's when seeding was largely discontinued. The application of World War II technology in range improvement was startling in its results. Using the sagebrush ranges of Nevada as an example, about 1 million of the 27 million acres of sagebrush rangeland were seeded between 1955 and 1972. This seeded area constitutes only 2% of the total rangeland in Nevada, but produces 10% of the harvestable grazing from the state's rangeland. The crested wheatgrass seedings produced early spring grazing on a sustained basis. Early spring grazing is especially valuable to the livestock industry and it is the period when native forage species are most susceptible to damage by excessive grazing. The successful seeding of crested wheatgrass on degraded sagebrush ranges helps to stabilize the livestock industry and adds a sense of vitality to range management in the Intermountain West (Young and McKenzie 1982).

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