The Northern Great Plains—Canadian Connection

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The Northern Great Plains extension into Canada runs northwest past Edmonton, Alberta, then southeast through Saskatchewan towards Winnipeg, Manitoba. The foothills of the Rocky Mountains are the natural western barrier of the Northern Great Plains grassland area. Approximately 150,000

Fig. 1. *The Canadian portion of the Northern Great Plains is bounded on the east near Winnipeg, Manitoba, on the north by Saskatoon, Saskatchewan, and Edmonton, Alberta, and in the west by the foothills of the Rocky Mountains.*

square miles of the area are in Canada and about 600,000 square miles are in the United States. In Canada, most of the area is cultivated except for about 50,000 square miles that are still grassland. Throughout the grassland area, level and moderately rolling tracts of clay, silt, or loam soils are farmed. Steeply rolling areas and eroded, shallow, sandy, or saline soils support native grass and are used for grazing. The vegetation is dominated by a mixture of midgrasses and shortgrasses, principally needle-and-thread *(Stipa comata),* blue grama *(Bouteloua gracilis),* Junegrass *(Koeleria cristata),* and the wheatgrasses (*Agropyron* spp.) typical of the Mixed Prairie Association.

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The area is an eastward-sloping plain between the Rocky Mountains and the Precambrian Shield. Soils are derived mainly from the glacial drift deposited by the continental ice sheets. The exceptions include an area in southeastern Alberta and southwestern Saskatchewan where ancient conglomerates, shales, and sandstones are close to the surface, and regions of limestone outcrop in the Interlake district of Manitoba and central Saskatchewan.

The main soils of the region are Orthic Brown Chernozemic (Aridic Haploboroll), Orthic Dark Brown Chernozemic (Typic Haploboroll), Orthic Black Chernozemic (Udic Haploboroll), Orthic Gray Luvisol (Typic Cryoboralf) and High Lime (Calcic) soils. Brown soils have developed under semi-arid conditions with the surface layer relatively low in organic matter and nitrogen. The profiles are shallow with limy subsoils close to the surface. Dark Brown soils have developed under less arid conditions. The surface layer is dark brown, the profiles are thicker, and the soils contain more organic matter and nitrogen than the Brown soils. Black soils have developed under still moister conditions; the surface layer is black and rich in organic matter and nitrogen. Gray Luvisol soils occur west and north of the Black soils, adjacent to or under a tree cover. Gray Luvisols have an ash-colored, leached surface layer with low organic matter and nitrogen. High lime soils are very shallow, have a high water table, and have developed on extremely limy parent material. A belt of Solonetzic (Natriborolls) soils extends across all of these soil zones. Solonetzic soils were formed from parent material that was high in sodium salts. The subsoil is impervious, and the surface layer has often been wind eroded in patches and has been lost.

Beef Cattle Industry

There are about 6.3 million cattle in the Canadian prairie region, about 95 percent of them beef and 5 percent dairy. This population includes two-thirds of Canada's beef cattle numbers and one-sixth of the dairy cattle. About half of the beef cattle in the prairie region are in Alberta, one-third are in Saskatchewan, and one-sixth are in Manitoba. The forage resource available to these animals in 1986 included: 33.6 million acres of native rangeland, 6.25 million acres of seeded pasture, 6.9 million acres of seeded hayland, and 1.3 million acres of annual fodder crops including oats and corn. About 12 percent of the grazing was obtained from crop residue and stubble fields.

Beef cattle numbers on the prairies increased from 2.7 million head in 1951 to 6.0 million in 1987, for an average

annual growth rate of 3 percent. Therefore, there is a need for steadily increasing forage supplies on the prairies.

The structure of the prairie beef cattle industry has changed radically during this century. The classic concept of large cattle herds on vast, open range is still valid, but has become more the exception than the rule. Three-quarters of the beef cattle are on farms or ranches with herds of less than 122 head, and half of the calves are produced from herds of 26 cows or less. There are many strictly cow-calf enterprises, as well as strictly feedlot ones, but operations that have a mixture of cows, calves, and feedlot animals are common.

Cultivated forage crops will play an ever-increasing role in cattle production, but natural grasslands remain one of the valuable, renewable resources. Native rangeland still provides for more than a million calves a year, from land that would otherwise have little agricultural value. Many of the problems of the rangelands have come about because of heavy grazing pressure on what is essentially a low-yielding crop adapted to survival in a semiarid to subhumid climate. Recurring drought is a distinctive feature of the climate and is in a large part responsible for the very presence of the prairies.

Range Research

Range research and the development of range management in Canada began with the establishment of the Dominion Range Experiment Station near Manyberries, Alberta, in 1927. Repeated requests by stockmen for scientific study of the range resources resulted in the appointment of S.E. Clarke and L.B. Thomson in 1926 to investigate conditions in

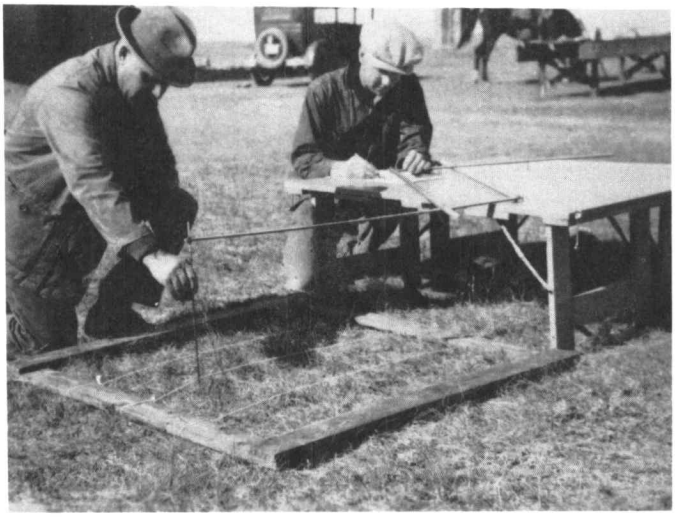

Fig. 2. *Dr. S.E. Clarke and E.W. Tisdale demonstrating the pantograph for charting range vegetation, 1929.*

the prairie range areas and to formulate plans for an intensive study of the problems. An area of about 18,000 acres of rangeland was chosen and a comprehensive program of investigational work was begun in 1928. The main objective was the acquiring of accurate and detailed information regarding the nature and proper utilization of the native vegetation. The projects included both rangeland forage and animal husbandry studies. In 1935, range research was also

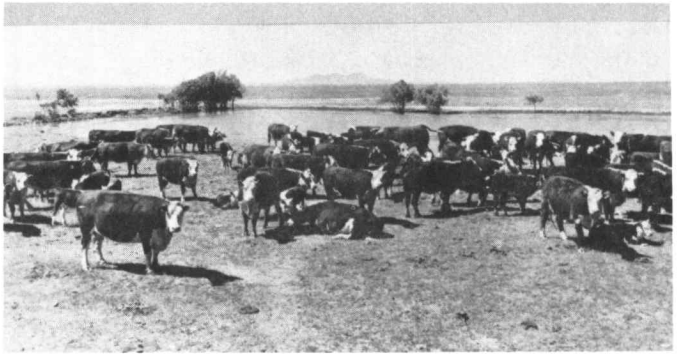

Fig. 3. *The development of water storage reservoirs was necessary before experimental grazing studies could be initiated at the Dominion Range Experiment Station, Manyberries, Alberta.*

established at the Experimental Farm in Swift Current, Saskatchewan, and regrassing stations were established by the Experimental Farm in Lethbridge, Alberta.

Variability of production from year to year is a problem of the rangelands, particularly in southeastern Alberta and southwestern Saskatchewan. Nearer the edges of the prairies, for example in the foothills, precipitation and grass growth are more constant from year to year. But the south is a region of violent extremes. At Medicine Hat, precipitation has ranged from 6 inches in 1910 to 28 inches in 1927, and at Manyberries, grass production ranges from about 86 to over 825 lbs/acre and is greatly influenced by seasonal (April to July) precipitation. Variability of production can be reduced by maintaining the range in good condition. Those ranchers who maintain their ranges in poor condition are trying to utilize a perennial crop as they would an annual, and hence, are at the mercy of every shower. However, the improvement of native range through deferment from spring grazing and by seeding more productive grasses on marginal crop land offers an opportunity to cattle producers to increase carrying capacity.

The need for regrassing programs has been generally recognized. As early as 1928, work on revegetation of abandoned fields under dryland conditions was initiated by experimental stations at various locations. These tests demonstrated that crested wheatgrass was the most suitable crop for reseeding purposes. Satisfactory stands could be obtained by seeding directly into a weedy cover during the fall months or on a prepared seedbed in the spring. The established crested wheatgrass fields were utilized for the production of seed, as permanent pasture, and in years of favorable moisture, for the production of hay.

With the introduction of Russian wildrye in the 1950's this grass has been used extensively in the revegetation of abandoned cropland. It is best grazed during late summer, fall, or early winter because of its higher nutrient content. About 2.5 million acres of crested wheatgrass and 250,000 acres of Russian wildrye have been seeded in the area. Altai wildrye, suitable for winter grazing, was released in the 1970's and varieties of thickspike and western wheatgrass were available for revegetation of rangeland in the early 1980's. New techniques in establishment, such as strip tillage and interseeding, and management of crested wheatgrass, Russian wildrye, ad other species have been investigated. This is of considerable importance as the seeded pastures complement the native range in the prairie region.

Accomplishments

The carrying capacity of Mixed Prairie range has been established as a result of long-term grazing trials. About 5.0 (2.5 to 6.5) acres of Mixed Prairie range are required for a cow for one month of grazing. Range condition and stocking rate guides have been prepared for use in the various vegetation zones. The guides are based upon the vegetative cover and yield of forage from areas grazed at known rates, relict areas, fenceline contrasts, and ungrazed or lightly grazed portions of fields. These guides are revised periodically to reflect current findings.

Studies have shown that seeded pastures can provide an important role in southeastern Alberta and southwestern Saskatchewan. They can lengthen the grazing season, provide for deferment and improvement of native ranges, supply grazing needs for special purposes, and increase grazing capacity two- to three-fold.

Fertilization of native range generally has been ineffective in increasing forage yields because of low rates of application. More recent studies have shown the potential of using massive applications of fertilizer for its residual effects. At high rates of nitrogen application, forage yields were increased two-fold over a 10-year period and the quality of forage was increased. However, native range fertilization is not recommended as a general practice in areas with less than 14 inches of annual precipitation.

Studies with fertilization of seeded grasses have shown differential response by species and sites, as well as differences in yields as affected by availability of moisture. As recovery of nitrogen by the plants is relatively low, massive amounts of fertilizer have not been recommended for hay production. The importance of including a forage legume in hay and pasture mixtures to provide nitrogen has been shown in the increased yields and quality of forage. Response to phosphorus fertilization has been low and varied.

Grazing systems have been evaluated from the standpoint of utilizing different forages to extend the grazing season to 10–11 months. Most grazing systems involve native rangeland, which is grazed during the summer. Forages such as crested wheatgrass can be grazed in the spring, Russian wildrye in the fall, and Altai wildrye in early winter. Deferring spring grazing on the native range pastures through the use of crested wheatgrass increases their vigor and productivity. Annual crops, such as oats, fall rye, wheat, barley, and ryegrasses, among others, also have been used to provide supplementary grazing.

Summary

The northern extension of the Northern Great Plains occupies about 150,000 square miles of total area in Canada. Of this, about 50,000 square miles remain in grassland that provides about 50 percent of the forage for about 6.0 million cattle. Although ranching played an important part in the early settlement of these areas, the national interest remained strongly centered on wheat as the prime product of the West. Thus, although an extensive system of experiment stations was established for investigations of cultivated crops and livestock, no attention was paid to rangelands until 1927 when the Dominion Range Experiment Station was established near Manyberries in southeastern Alberta. The station served as the center for range research in Canada for several decades.

Over the past 60 years, range researchers in western Canada have accomplished much in the management of rangelands. They applied ecological, soil, and other studies to identify the major vegetation zones and to determine carrying capacity by grazing trials, vegetation composition, and clipping trials. Ecological studies of different range areas led to the preparation of range condition guides and to the identification of sites and range condition criteria. The different systems of grazing—continuous, rotational, deferred-rotational, complementary, and repeated seasonal grazing systems—were evaluated in grazing trials in the Mixed Prairie region. Nutritional qualities of the range vegetation and changes in quality during the different seasons were determined. The advantages and disadvantages of rangeland fertilization were assessed. Pasture renovation through strip tillage or interseeding has also been evaluated. Improved strains of some native grasses for improving rangeland have been developed. ●

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