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October, 1972

RANGE RESOURCES IN THE INTERIOR OF BRITISH COLUMBIA

ABSTRACT

In this report an attempt will be made to survey the importance of cattle ranching in British Columbia. Some of the significant changes that have occurred in the cattle industry are revealed by scanning the history of this industry. The key to beef production in British Columbia lies in the management of range resources. Incidentally range land is considered to be any area grazed by cattle. Since most of the range land of British Columbia is found on the Interior Plateau, that region will be the focus of this study. An analysis will be made of existing grazing resources. The amount of land available for grazing is limited. Therefore, to increase beef production, more intensive use will have to be made of range land. The latter part of this report will examine some of the possibilities that may serve to increase cattle production on the ranges of British Columbia.

Although cattle ranching is not the most important economic activity in British Columbia, it does constitute a sizeable and vital portion of the agricultural life of the province. Canadian census reports indicate that in 1966, for example, there were a total of 546,013 cattle in British Columbia valued at 81,162,180 dollars. The value of livestock sold in 1966 was 30,491,790 dollars, which was nearly 30 percent of the total value of all agricultural products sold. Current trends suggest that ranching will continue to be important. The demand for meat, for instance, seems to indicate an expanding market for beef suppliers. Figures reveal that Canadians consumed 58 pounds of beef per capita in 1941 and 83 pounds by 1963. Projections are for beef consumption to reach 98 pounds per capita in Canada by 1980.[1] There are other factors, in addition to increased average consumption, which point to a growing demand for beef. Rapid industrialization and population growth in British Columbia, as well as in other parts of the world, are perhaps the most significant. At the present time British Columbia produces only about one third of her beef requirements. Since she has the potential to produce much more beef, it is likely that cattle ranching will continue to be an important agricultural enterprise.

HISTORICAL PERSPECTIVE

Ranching has long been associated with the settlement and development of large areas in the interior of British Columbia. The range story is one of many changes. Settlement following the gold rush in 1858 provided the initial incentive for local beef production. Later the Klondike gold rush in 1898 helped establish permanent markets for

the nascent industry. In the early days grazing was confined almost entirely to the open grasslands; cattle were virtually allowed to run wild on these pastures. However, they were soon stocked to capacity. Consequently more and more use was made of forest range for summer grazing. This entailed the multiple use of much of the forested land. With it emerged many problems of administration and management. It is still not known, for instance, what the long term effect of grazing cattle among young trees will be on the logging industry. Nor is it certain how ranching will affect wildlife, recreation and water management in forested areas. In addition to using forest for pasture land, ranchers now store feed for winter when grass is limited. Because of new considerations, the use of range resources has become more complex than it was in the early days of ranching.

In the range story of British Columbia, the marketing of beef has undergone the most pronounced change. At first steers were sold at an age of 3 years or more. However, competition has reduced the market age for beef animals. For several decades up to the mid-nineteen fifties nearly all cattle were marketed as 2-year-olds, finished on grass and shipped directly from the ranch to Greater Vancouver (Fig. 1). Since then beef pastures have become breeding pastures. Most cattle are now sent as yearlings to be fattened in feedlots before slaughter. Only one half of them go to the Lower Fraser Valley feedlots; the rest go to Alberta and other grain-surplus areas to the east, or to the United States (Fig. 1). Incidently, this pattern of marketing seems to parallel an established practice in the United States. There, cattle are bred on open ranges in Washington and Arizona and yearlings are shipped east to the corn belt for finishing.

In Canada feedlots were used to some extent in southern Alberta, but it was not until the Prairie wheat surplus of 1956-57 that the use of grain for finishing beef cattle became widespread. The unprecedented demand for feeder-stock on the Prairies in 1956 and the shortage of cattle in the United States in 1957 helped establish British Columbia's new marketing pattern. The Interior Plateau is not a grain producing area and it is uneconomic to import grain.[2] Therefore, most ranchers do not finish their own animals. They find it more profitable to use their land for producing yearlings and then to ship them to feedlots for finishing. Accordingly the odd situation exists where nearly all live animals are shipped out of British Columbia and consumer beef in the province comes largely from Alberta. This situation is expected to continue not only because of economic considerations but also because of growing consumer preference for grain-fed beef. Chain-store sales techniques of selling pre-cut showcase beef have abetted changes in demand. The number of animals British Columbia markets in the forementioned arrangement is largely determined by the availability of grazing resources.

RANGE AREA

The range lands of British Columbia are largely confined to the

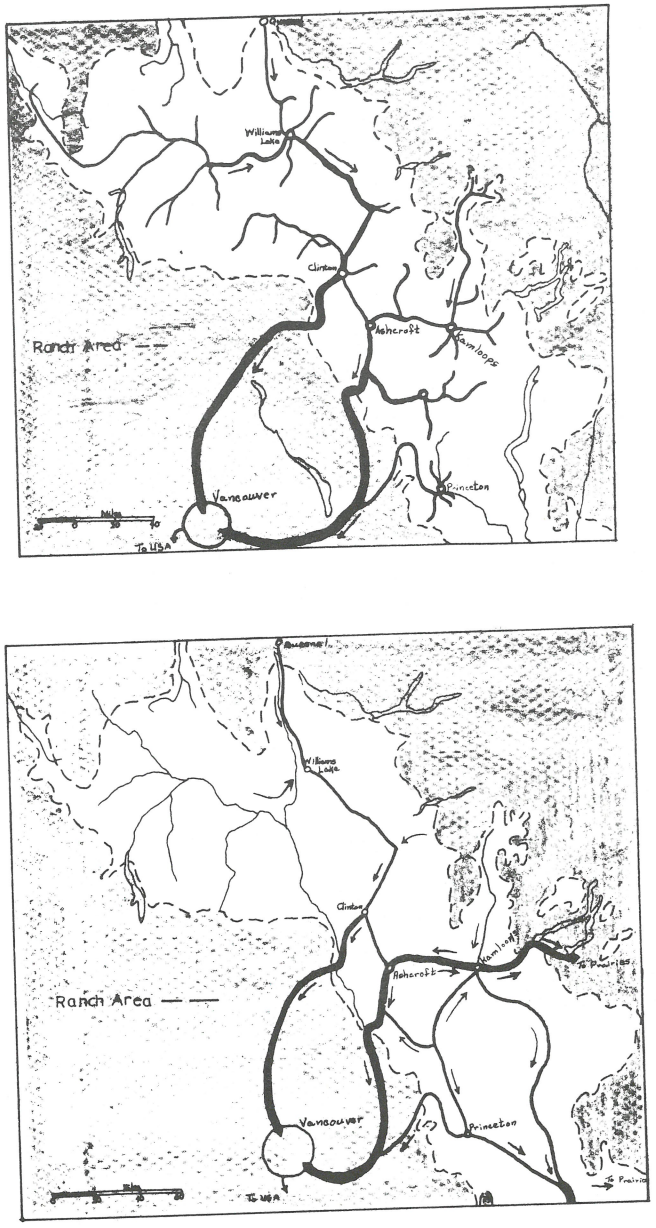


Fig. 1. Sketch maps showing cattle flow in 1948 (top) and 1960 (bottom).

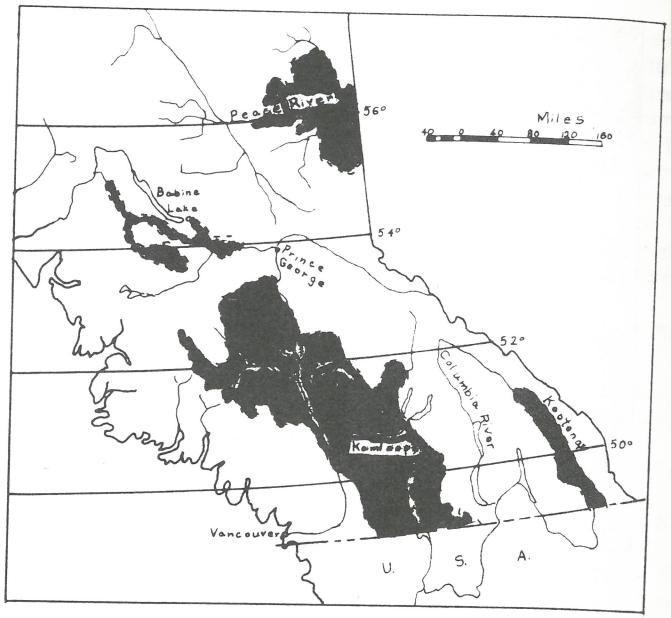


Fig. 2. Outline map showing location of major range areas (shaded) in British Columbia.

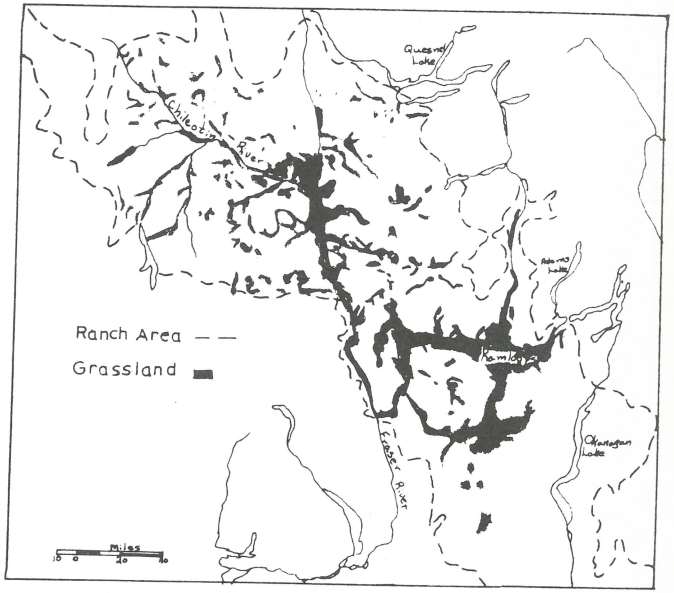


Fig. 3. Distribution of native open grassland.

area between the Rocky Mountains and the Coast Range. Although an appreciable amount of range land occurs in the northern part of this area, the present study is restricted to the southern portion of the region. Here the bulk of the grazing land is found (Fig. 2). The grazing resource of the southern Interior Plateau consists of about 3,250,000 acres of open grasslands concentrated in the major river valleys (Fig. 3) and over 8,000,000 acres of forest range at higher elevations. It is the relatively small total acreage of open grasslands that is the principal limiting factor to livestock production in British Columbia.[3] Past overgrazing has greatly reduced the carrying capacity of these ranges. It now takes from 20 to 40 acres to support each head of stock grazed on them on a 6-month basis. Besides, large areas of highly productive grasslands have been put under cultivation because of more competitive land uses. The Okanagan Valley is a case in point. Moreover, Forest Service officials seem to have serious reservations about continuing to let ranchers use forested areas for grazing purposes. If beef production is to be increased in British Columbia, a tremendous challenge exists for the greater use of range resources.

A survey of the physical features of the area helps one appreciate some of the problems involved in using range resources. Topographically, this area is marked by a series of rugged plateaus separated by broad, deep valleys (see Appendix). The general area around Kamloops, for example, varies between 3,000 and 6,000 feet in elevation into which river and creek valleys have been eroded. Valley bottoms range from about 600 to 2,000 feet in elevation. For most of the Interior Plateau drainage is to the west through the Fraser River and its tributaries. Glacial till of variable texture forms the main parent material of range land soils; rock outcrops are common. This rough landscape is hard on cows and young calves. In addition to the risk of injuries, predators such as bears and cougars can easily prey on herds scattered over the hilly pastures. It is expensive to build and maintain fences. This explains why very few ranchers practise rotational grazing on their ranges. It also helps one to understand why many grazing areas are not used to their full capacity.

The capacity of range resources is greatly influenced by climate. The Interior Plateau lies in the rain shadow of the Coast Mountains to the west; precipitation is therefore relatively low (Fig. 4). The annual range of temperature includes extremes of 100° F. in summer and -20° F. in winter. Local climate is also strongly affected by such factors as elevation and exposure. For instance, valley bottoms are usually 20 degrees warmer than the plateau areas. At the same time precipitation increases with elevation. Since evaporation exceeds precipitation at the lower levels, it is not uncommon to find stagnant, saline ponds scattered throughout the range in late summer and fall. Extremely dry conditions can create problems in watering stock and can quickly reduce the carrying capacity of the range. Overgrazing during such times may lead to less desirable plants replacing the better grasses. This is one of the basic reasons for the abundance of sagebrush around Kamloops.

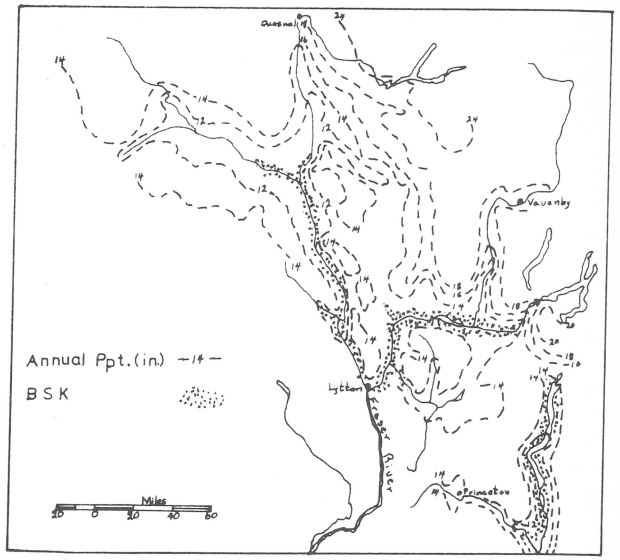


Fig. 4. Precipitation in the Interior Plateau.

The length of the growing season is another critical factor affecting land use on the Interior Plateau. A frost-free period of over 150 days exists at some lower elevations in the south; it is usually less than 100 days in the more northern valleys and at higher levels. However, temperature inversions sometimes bring early frosts to valley bottoms even in the south. This phenomenon may reduce the growing season by as much as 45 days from what it is at about 500 feet above the same valley floor. Although irrigation is possible in many valleys, crops susceptible to frost damage can only be produced with a high degree of risk. The general area around Kamloops, for instance, is climatically borderline for the commercial production of such crops as tree fruits and grapes.[4] However, native grasses are well adapted to this area. Different species appear at various elevations. Grasses in the valleys start their growth each spring sooner than those on the higher areas. Consequently, fresh vegetation is available during much of the year. Since cattle thrive on these pastures, ranching seems to be ideally suited to the interior of British Columbia.

RANGE TYPES

Range land is the basic factor in a ranching economy. Ranges are usually classified either by season of use or by vegetation cover.

A classification based on vegetation cover is presented below to provide an overall picture of the range resources found in the interior of British Columbia.[5] The Range areas have natural divisions based on altitudinal zone. Each zone has different characteristics of climate, vegetation, soil and grazing use. Because of the vertical zonation of vegetation, ranching on the Interior Plateau has a distinctive grazing pattern. With the coming of spring cattle find fresh grass in the valley bottoms. As the snow melts the animals move up the slopes with pasture growth. The protein content of the new grass is around 14 percent, more than sufficient to provide a nutritious diet for fresh cows and their calves. By midsummer or early fall the stock will have exhausted the upper pastures and will then be moved down the slopes taking advantage of secondary growth on the idle pastures. Incidently, surplus grass in the valleys is usually stored for winter feeding.

GRASSLAND RANGES

Grassland Zone	Wheatgrass-sagebrush	Wheatgrass-bluegrass	Wheatgrass-fescue
Elevation (ft)	1100-2000	2000-2600	2600-3000
Ppt./yr. (in.)	9-10	10-11.5	11-13
Mean Temp. (oF) July	73	70	66
Mean Temp. (oF) Jan.	23	22	20
Mean Temp. (oF) Year	48	47	45
Soils	Brown, medium texture, slightly saline at 1 ft.	Dark Brown, light texture slightly saline at 1.5 ft.	Black medium texture, neutral lime at 2 ft.
Grazing Use	Early spring late fall and winter	Spring and fall (early May & Oct.)	Spring and fall (late May, June and Oct.)
Ave. Forage Yld. (lbs./acre)	400	600	1200
Grazing Capacity (Acres/A.U.M.)[a]	3	2.3	1.1

[a]A.U.M. is animal unit month

Note: As the elevation increases, mean temperatures and evaporation decreases and moisture effectiveness increases.

Source: Compiled from date provided by A. McLean and L. Marchand, **Grassland Ranges in the Southern Interior of British Columbia,** Canadian Department of Agriculture, Kamloops, 1968 and E. W. Tisdale, A. McLean and S. E. Clark, "Range Resources and Their Management in British Columbia," Reprinted from **Journal of Range Management,** vol. 7, no. 1, Jan. 1954.

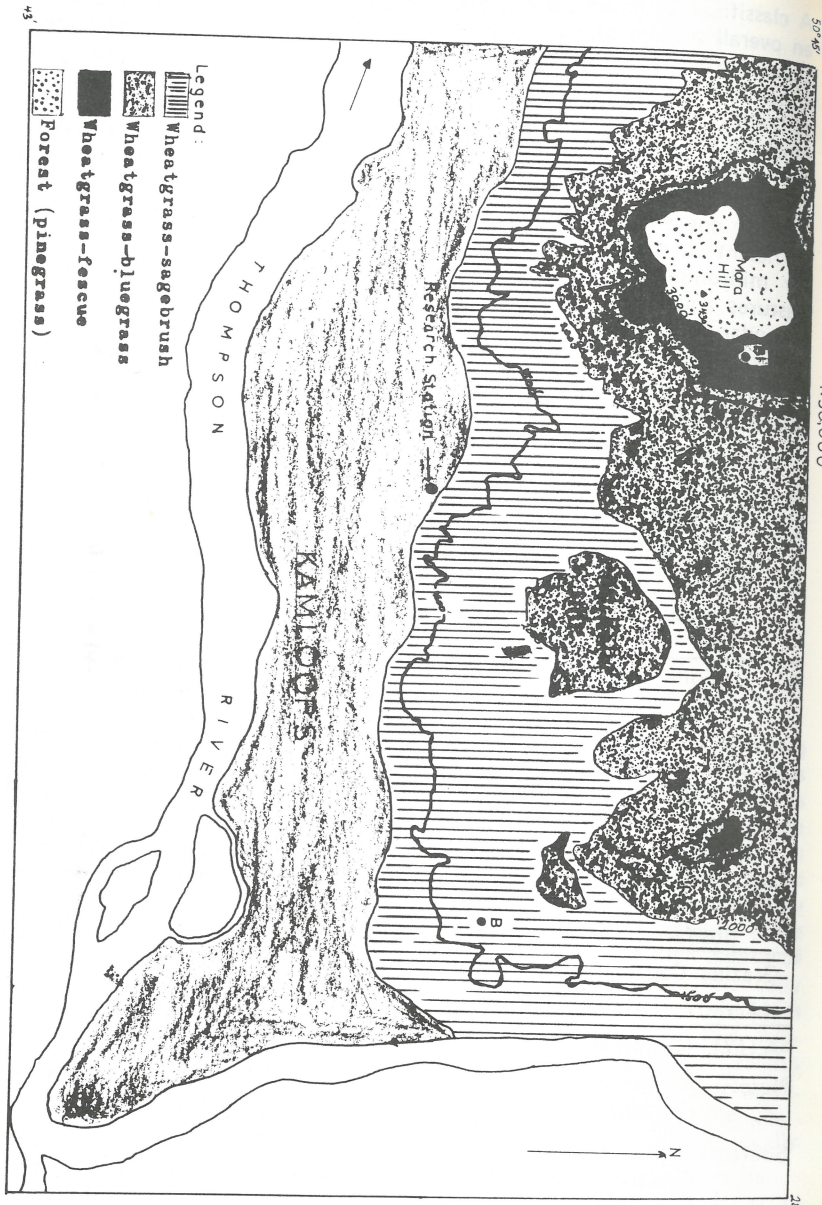


Fig. 5. Transect area showing grassland areas and soil profile description sites referred to in text; B-Brown soil, DB-Dark Brown Soil, Bl-Black soil. Contour interval = 500 feet.

Grassland ranges are important as sources of spring, fall and winter grazing. Pictures are included in the Appendix to illustrate each range type. Figure 5 shows the verticle zonation of grassland as they occur in the vicinity of Kamloops. Bluebunch wheatgrass **(Agropyron spicaturn)**, the principle grass in the region, is associated with other species found at different elevations. In the lower areas vegetation is sparce because of the low moisture effectiveness. Still these areas are well suited for early spring and late fall grazing where sufficient acreage is available. Incidentally, it was noted that north facing slopes in this zone were covered with considerably less sage-brush than south facing slopes. Probably because moisture effectiveness was higher on the former slopes they supported fescue grasses usually found at higher elevations. The upper grassland zone is the most highly developed and productive of the grassland types This association of wheatgrass and rough fescue **(Festuca scabrella)** is especially valuable as late spring and early fall range.

The quality of grassland ranges may fluctuate with the ways in which they are used. Overgrazing is an expression of careless use of range resources. An extreme case of this was evident during the drought period of the 1930's when horses and cattle severely overgrazed the range around Kamloops. Since 1940 the range has been grazed only in the spring and fall. Reduced grazing plus years of better moisture conditions have allowed the range to recover. However, there is still evidence of where overuse has greatly reduced the quality of grazing areas. For example, on the slopes north of Kamloops at about 1500 feet there is a preponderance of big sagebrush **(Artemisia tridentata)**. Dr. A. McLean, Ecologist at the Research Station, believes this situation exists because continued overgrazing has permitted big sage to increase at the expense of the more palatable bunch grasses. The nutritive value of sagebrush is lower than wheatgrass and cattle seldom eat it. Grazing capacity is therefore considerably less than if a more balanced ecological system was permitted by better grazing practices. Overuse at high elevations also reduced the quality of forage available. Wheatgrass and fescue, for instance, may be replaced by other perennial grasses and finally by a totally unpalatable weedy cover. Grassland ranges are a naturally renewable resource; however, their continued usefullness to man depends on wise management.

FOREST RANGES

Within the dry interior of British Columbia are about 15 million acres of relatively open forest which are suitable for livestock grazing as well as timber production. These forest ranges provide most of the summer grazing for cattle. They have been classified into three zones: ponderosa pine zone, Douglas fir and spruce fir. Again a vertical zonation of the pasture types is evident. The ponderosa pine zone at the lower edge of the forested area has well developed undercover vegetation. Wheatgrass and rough fescue are among the main species in this zone providing a nutritious pasture early in the summer. This pasture has a grazing capacity of about 2.5 acres per A.U.M.

By far the most valuable area for forest grazing is the Douglas fir zone. Although there is usually adequate soil moisture for growth throughout the summer, the temperatures at this altitude limit the growing season to 3 months or less. Consequently, grazing in this zone is possible only from mid-June until near the end of September. Fires have influenced the grazing resources of this zone. In many areas lodgepole pine and aspen are found instead of the climax tree. Grazing values vary with the local forest cover. For example, pasture in association with aspen has a higher grazing capacity than areas occupied by conifers.[6] In general, however, the tree stand is relatively open with a well-developed undercover of vegetation. Pinegrass **(Calamagrostis)** is the main grass species; however, plants such as peavine **(Lathyrus)**, wild rose **(Rosa)** and willow **(Salix)** are also important sources of herbage. During the grazing season the carrying capacity of these ranges is approximately 4 acres per A.U.M.

In the spruce-fir forest zone the tree cover is relatively dense; consequently, grazing is largely confined to the numerous wet meadows and park-like openings. The meadows are situated in basins left by glaciers or sometimes in old beaver ponds. They usually flood in spring and early summer and in most years become dry enough to allow grazing or cutting by mid-July or August. Sedges are best adapted to the organic soils found in the meadows; intermediate oatgrass **(Danthonia intermedia)** grows in the drier openings. Meadow areas are often extensive and provide large amounts of fairly palatable forage. Around Kamloops meadows occupy about 6 percent of the spruce-fir zone. Ranchers use these meadows almost completely for summer grazing. Meadows are more important to the ranching industry further north in the Cariboo district where they comprise over 10 percent of the spruce-fir forests, approximately one million acres. Ranchers in this district obtain most of their winter feed from subalpine meadows. Hay is cut in mid summer after which cattle are grazed on the meadows until late fall.

A short growing season seems to affect the quality of the range found in the spruce-fir forest zone. One study of a meadow near Kamloops revealed that approximately 90 percent of the season's growth based on yields took place before the end of July.[7] The forage from that meadow was of low nutritive value even though it was ranked above pinegrass. Protein levels, for instance, were not high at any time and fell below 10 percent, the level required for rapid growth of yearling cattle, by mid August. By late fall the nutritive level was not enough to maintain stock weight, even for mature animals. It is therefore recommended that a high protein supplement be provided if native species are to be used for extended grazing in late fall and early winter.

RANGE IMPROVEMENT

The preceding analysis of range types provides the background for a discussion about the prospects that exist for improving range resources. A greater production of beef could probably be realized immediately if better use was made of available pasture lands. It has been stated

that the grasslands are the principal limiting factor to livestock production in British Columbia. A recommended management program is to graze the grassland for a short period in the spring and then remove all livestock to allow regrowth prior to summer dormancy. This management practice would ensure ample forage later in the grazing season. It frequently fails, however, due to the difficulty in obtaining alternate range – namely forest range. The result is that the limited grassland range is commonly overgrazed and the more abundant forest range is only slightly used. This situation could be improved by using the recommended management practice and by grazing the many acres of forest range that are currently inaccessible to livestock. To open new areas of forest range trails may have to be cut. Planting succulent grasses on these paths would help entice the cattle to use these grazing areas.

The uneven distribution of livestock on range land points to the need for controlled grazing. Rotational grazing on a scientific basis is rarely practised by any of the ranchers in the interior. Research has demonstrated that systematic range management can bring significant gains. For example, in 1969 pasture trials were conducted on three areas of forest range, each of similar size and of comparable grass cover conditions. The first plot was treated as a control unit. Stock were allowed to graze it freely during the summer season as is the practice on most ranches. Three paddocks of equal size were fenced on the second plot. Cattle were pastured in each paddock for five consecutive weeks. The third plot was divided into two paddocks, one twice as large as the other. Stock were kept in the larger pasture for six weeks, then moved to the smaller one for six weeks and finally returned to the former to complete the grazing season. Weight gains per day of growing stock on each of the three plots were 1.54 pounds, 1.45 pounds and 1.79 pounds respectively. Greater gains on the third plot are believed to result from regrowth which occurred on the large pasture while the cattle were in the smaller paddock. In this connection it must be remembered that it is most difficult for animals to find nutritous forage towards the end of the grazing season. From this experiment it is obvious that a relatively small area can support a large number of animals if it is allowed to grow for several weeks before grazing starts. However, the third pasture on the second plot had a lower grazing capacity because no regrowth occurred. Agricultural authorities believe that the full potential of range resources in interior British Columbia will not be realised until rotational grazing practices are adopted by the majority of the ranchers.[8]

The application of fertilizer is another way greater use may be made of range resources. Available information indicates that most native ranges fail to meet the nutritional requirements of grazing cattle, especially yearlings, with respect to protein and phosphorus after mid-August each year. In fact, the seasonal decline in nutritive value of native forage probably limits range use and animal production more than the volume of forage produced. Nitrogen is the single most deficient element on rangelands. It is not surprising, therefore, that nitrogen fertilization increases the crude protein content of range forage.

The case of pinegrass epitomises the situation. By early September unfertilized pinegrass usually has a crude protein content of 6 percent, only one-half the minimum required for the active growth of calves. Research has shown, however, that applications of nitrogen during the summer can increase the crude protein content from 8.5 to 17.0 percent.9 Palatability was also improved. The significance of this is obvious when one remembers that pinegrass dominates about 80 percent of the area within the 15 million acre forest range and is used extensively as the principal species for summer grazing in the southern interior of British Columbia. It might also be implied that fertilizer could be used on various selected areas to improve the distribution of cattle over the range. This would increase the total utilization of the range and the yield of beef.

Although the application of fertilizer can improve both quality and quantity of forage yield, it is not a widely used farming practice. There are economic and physical factors to contend with in fertilizing rangeland. The costs and benefits are often difficult to assess. For example, should fertilization happen to double the carrying capacity of rangeland, the stockman will likely increase the size of his livestock enterprise in order to utilize the additional pasture. In most cases this would necessitate an expansion of a rancher's winter feed supply, which could be a limiting factor. Besides, there is some degree of risk involved in spreading chemicals over grazing areas. If too high rates of fertilizer are used, for instance, nitrate poisoning in stock or invasion of weedy species could result. Suppose also that drought conditions prevail after application, fertilizer response may be too low to cover the costs involved. On the other hand, increased palatability could lead to overuse and eventual pasture deterioration, particularly if cattle numbers and length of grazing period are not carefully controlled. It seems therefore that, despite the possible benefits, most ranchers have concluded that fertilization of rangeland will not bring an economic return.

Nevertheless research is continuing. Cheap ways are being sought to apply fertilizer to stony land with rough topography. Experiments with herbicides in combination with fertilizer may lead to extra benefits for ranchers. Assessments are being made on the effects of fertilizer on trees and shrubs in multiple-use areas where forage, forest and game users may share the same land. This would help to decide apportionment of fertilizer costs if benefits could be shown for more than one user. Scientists are also studying the many nutritional implications of range fertilizer. Much is still to be learned about the types of range and range soils that will respond adequately to meet both nutritional and economic requirements. In short, research may lead to a more intensive use of range resources.

Reference has been made to the value of sedge bogs to the ranching industry of British Columbia. It was stated that while yields surpass neighbouring forest ranges the quality of forage from most subalpine meadows is low. Basic to the improvement of meadows is water control.10 Fertilizer has also been used to try and improve production.

Applications of nitrogen, phosphorous and potassium have increased yields of native hay from about one half ton per acre to about two tons per acre.11 In addition palatability is enhanced; the grazing season may also be extended. Though fertilizer increased the quantity of forage produced, it did not change the quality of natural species. It has been suggested, therefore, that perhaps a domestic forage of better quality could be established on the bog soils of the ranching districts. For example, promising results have been obtained from experiments with reed canarygrass. "Reed canarygrass is recommended for seeding organic meadows because it is not easily killed by trampling or flooding and its yields are high under optimum fertilization (over 5 tons per acre.) It forms a dense sod that will support machinery and livestock and it provides nutritious hay, silage or pasture."12 With a crude protein content of 9 percent at maturity, this grass offers a real potential especially for the Cariboo district where there are about a million acres that could be planted.

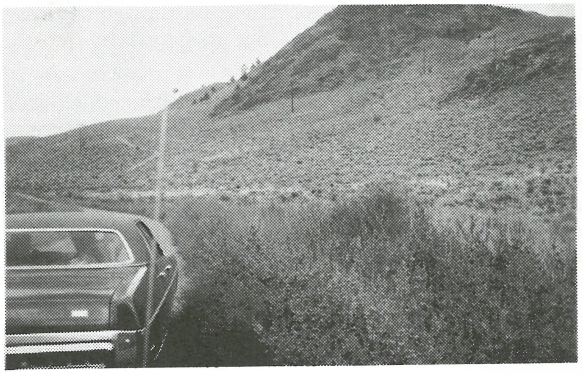
CONCLUSION

There are many ways by which better use might be made of range resources. Information and research seem to be well ahead of current practices. The nature of the rancher himself is important in understanding this situation. In the early days the rancher was a rugged individualist who carved his own empire in a frontier environment. Perhaps it is his heritage that makes him inconsistant with regard to change. A rancher will often readily adopt innovations pertaining to his animals but resist new recommendations for forages, fertilizers, and cultural practices. Thus we see him growing obsolete varieties of forage while using hormones, antibiotics and expensive imported bulls.13 However, ranching has been evolving from a way-of-life to a business. Tradition plays a lesser part in the thinking of men who have recently become ranchers. On many of the larger ranches it is now becoming common practice, for instance, to manufacture silage for winter feeding. The use of ensilage is a sophisticated farming technique to obtain high yields from crops before they are damaged by frosts in an area with a relatively short growing season.

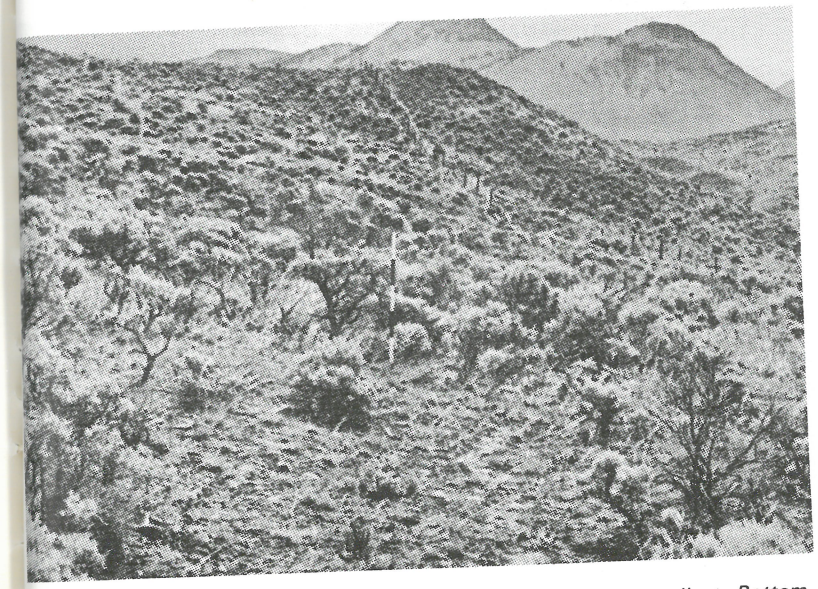
New techniques are constantly being introduced which will improve the cattle industry. Range resources provide the basic raw materials for this industry; their potential seems enormous. Besides, grass with management is an ever renewable resource. Markets are readily available for increased beef production; in British Columbia alone demand far exceeds supply. Any appreciable increase must come from more intensive use of existing range resources. This report has attempted to show that this is the direction the cattle industry is now taking. It seems therefore that ranching will probably continue to be the main economic activity of the vast rangeland in British Columbia.

APPENDIX

Picture showing landscape of interior British Columbia



Pictures showing north facing (left) and south facing (right) slopes of a valley north of Kamloops at about 1500 feet.



Big sagebrush — bluebunch wheatgrass condition classes. Top, excellent. Bottom, poor.

Bluebunch wheatgrass - Sandberg's bluegrass condition classes. Top, excellent. Bottom, poor.

Bluebunch wheatgrass — rough fescue condition classes. Top, excellent. Bottom, poor.

Ponderosa pine condition classes. Top, excellent, Bottom, poor.

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PERSONAL INTERVIEWS

1. Interviews with A. Bawtree, Extension Range Specialist, B.C. Department of Agriculture, and A. McLean and A. L. van Ryswyk, Research Officers, Canada Department of Agriculture. Kamloops, Sept. 8, 1972.

FOOTNOTES

These figures are given by I. F. Furniss and V. W. Yorgason, **The Economics of Beef Production,** Canada Department of Agriculture, Ottawa, 1971, p. 5.

Mr. A. Bawtree, Extension Range Specialist with the B.C. Department of Agriculture, said few ranchers are prepared to consider importing grain at the present time. Grain prices, freight charges and costs for new feeding equipment are the main expenses involved. Interview with Mr. Bawtree at Kamloops, September 8, 1972.

This is the belief expressed by federal and provincial agricultural authorities stationed at Kamloops. See A. McLean and T. G. Willis, "The Range Story of British Columbia," reprinted from **Agricultural Institute Review,** Jan.-Feb., 1961, p. 1.

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A range classification by season of use is given by Thomas R. Weir, "Range Types and Distribution of Livestock in the Southern Interior of British Columbia," **Readings in Canadian Geography,** Toronto, 1968, pp. 299-316.

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