UNITED STATES DEPARTMENT OF AGRICULTURE
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THE RANGE RESOURCES OF COLORADO

by

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A Preliminary Report of the
Rocky Mountain Forest and Range Experiment Station

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IMPORTANCE OF THE RANGE RESOURCES TO THE STATE

In creation of wealth the range livestock business in Colorado is second among the basic industries of the State, being surpassed only by manufacturing. The value of livestock and livestock products annually sent to market from Colorado ranges is nearly 60 million dollars (1); the investment in herds, ranch buildings and lands is estimated at more than 500 million dollars (2). About 106,000 persons, or 26.3 percent of the number in the State 10 years old or more are employed in agriculture (2). Of this number it is probable that at least 50 percent earn their living directly from the raising of livestock on the range. In addition many other people are indirectly dependent for a livelihood on the industry and several other important industries owe much of their prosperity to the livestock business. In some parts of the State, lamb feeding and finishing of livestock for market provides winter work for farmers and makes an economically integrated agriculture possible. Because of extensive plains and semi-desert areas of little precipitation and high mountain areas that can be used for no other purpose, at least three-fourths of the land in the State is chiefly suitable for the raising of livestock.

1/ This report must be considered as preliminary and subject to revision as rapidly as new data become available. Suggestions for additional material and corrections of the data here given will be welcomed. This paper was prepared for inclusion in a general report on the Agricultural Resources of Colorado.

2/ Maintained by the U. S. Forest Service at Fort Collins, Colorado, in cooperation with the Colorado State College of Agriculture and Mechanic Arts.

3/ Maintained by the Colorado State College of Agriculture and Mechanic Arts.
Colorado and other States in the Rocky Mountain region produce a surplus of livestock, which has a ready market in the consuming centers of the East. The States west of the Mississippi River raise about two-thirds of the nation's meat while the densely-populated regions farther east eat nearly two-thirds of it. Since 1900 consumption of meats in the United States has averaged about 140 lbs. per capita or about 7 oz. per day per person. Of the total, about 45 percent has been pork, 44 percent beef, 4.5 percent lamb or mutton, and 7 percent veal (3).

Today there are five million head of livestock on the farms and ranches of Colorado valued at nearly 91 million dollars (4). Colorado ranks fifth in the United States in number of sheep and eleventh in the number of beef cattle. In plant value of meat packing products Colorado ranked twentieth in 1933 among the 48 States. In manufacture of all products the meat packing industry ranks second in the State, being exceeded only by the beet sugar industry (3). Colorado farmers and stockmen fatten for market annually between 75,000 and 150,000 cattle of which approximately 75 percent are fed largely on sugar beet by-products (5). In addition about a million lambs are fattened in farm feed-lots each year (4). The production of livestock on the range is two-thirds of the total livestock production in the State.

Colorado has always been an important livestock State and has occupied a conspicuous place in the development of the Western livestock industry. Some of the most thrilling and romantic chapters in the history of the West deal with the exploits of the cowboys on the western plains, the early cattle trails, the range wars, and many other events that happened upon American frontiers in establishment of the range livestock industry.

**HISTORY OF RANGE USE IN COLORADO**

Prior to the discovery of gold in the late fifties and early sixties there were few herds of cattle or sheep in Colorado. Raising of domestic livestock on a large scale was being practiced, however, by the Mormons in Utah, by the Mission padres in California and tremendously large herds of cattle had been built up in Texas. In 1821 the Mexican Government contracted with Moses Austin to bring settlers into Texas and many came, enticed by liberal grants of land. The mild climate favored cattle growing and the Texas herds, which numbered about 100,000 in 1830, had increased to 3,533,000 head in 1860. In a sense, Texas became literally overrun with cattle for which there was an insufficient market. This situation was to have a profound influence on the range industry of Colorado. When gold was discovered in Colorado, cattle were brought in from California and Utah to provide beef for the mining camps. By 1870 there were around 271,000 head of cattle in the State (6).
About that time the Texas cattlemen, without a market for their surplus stock after the Civil War, discovered the possibility of trailing to better ranges to the northern States for fattening and subsequent shipment East on the transcontinental railroads which just then were penetrating the northern range country but had not crossed Texas. At first, the Texas cattle were trailed to Sedalia, Missouri, but armed opposition by farmers soon turned the Texas drovers back. The Texas cattle were afflicted with tick fever and spread of the disease among local cattle was almost a certain result of the passage of the Texas herds. The Texas cattle drives then turned westward into Kansas for shipment over the Kansas Pacific Railroad to Chicago and St. Louis. In 1867 preparations were made at Abilene to ship 3,000 head but 35,000 actually went out that year, 75,000 in 1868, 150,000 in 1869, and about 700,000 in the fourth year. The first trainload of Texas steers went east from Colorado in 1869 from Kit Carson, then the terminus of the Kansas Pacific. By 1885 a total of more than 5 million cattle had been driven northward from Texas (6).

In 1881 the price recovery from the 1873 depression generated in the range industry a tide of expansion which became a veritable flood in 1885. The discovery of the grass bonanza fired the imaginations of lawyers, merchants, farmers, laborers and bankers who rushed in to seek their fortunes, the poor by personal effort and the rich by investment. A large promotion literature flourished, including such widely circulated books as Brisbin's "Beef Bonanza" which showed on paper how $25,000 would in 6 years pay all expenses and leave a fortune of $51,278. Both eastern and Old World capital, the latter largely from England and Scotland, flocked through the expectation of immense profits to be realized within four or five years. In 1883 in Wyoming alone, 20 mammoth cattle companies were organized with a total capitalization of more than $12,000,000. Some of the Colorado livestock enterprises were equally large. John W. Illiff, who began operations in the sixties, by 1877 owned 15,000 acres but controlled (through this owned land, which was along permanent water) 650,000 acres; he ran 35,000 head of cattle on 9 ranches and kept about 7,000 breeding cows. In addition, he had an annual turnover of about 15,000 Texas steers trailed up from the South and finished on grass in one or two seasons. The Prairie Cattle Company was organized under the laws of Great Britain in 1881 and owned 2,240,000 acres in Colorado on which 54,000 head of cattle were grazed. This range was east and south of the Purgatoire and Arkansas Rivers to the Cimarron. The same company owned another ranch in New Mexico and Oklahoma totalling 2,580,480 acres with 57,799 head of cattle; and still another property along the Canadian River in Texas where 30,000 cattle grazed on 256,000 acres. By 1880 there were 809,000 head of cattle in Colorado and by 1886 there were 1,356,000 (7).

Coincident with the boom in the range industry came greatly increased settlement. Some of the influx in settlement found expression in establishment of many small cattle outfits. Then it was discovered that dry-land farming was a possibility and that in favorable years these virgin grasslands could be made to grow wheat. Millions of acres of native grassland
passed to private ownership in small tracts under the homestead laws and through sale of land by the railroads. Barbed wire fences appeared on the range. The large livestock outfits which previously had run their cattle without regard for land ownership felt that their range "rights" were endangered and combined to preserve the monopoly of the range they had enjoyed under these illicit "rights". Thus began the struggle between the big owner and the little owner with the cattle rustler as an unrecognized but inevitable ally of the small owner. Agreements among the big stockmen not to cooperate with newcomers in round-ups and other group activities, in a concerted effort to squeeze out the small owners, aroused resentment. Affairs gradually assumed a state of social warfare, culminating in 1882 in the "Johnson County War" when an association of large owners undertook to punish the residents of Buffalo, Wyoming, for "harboring and abetting rustlers". Several men were killed; the Army Reserves were called out; and arrests of well known stockmen followed. The matter was hushed up, but the big stockman's range monopoly was effectively broken and law and justice thereafter were applied with some show of impartiality to operators of both large and small outfits.

The cattle boom began to collapse after 1885. The expectation of fortunes to be made in a few years had led to gambling in futures and caused over-expansion both in investments and in range use. The accumulated forage of several years was consumed by overuse and by too early and too continuous grazing. Scarcely anybody was making provision for supplementary feeding or for setting aside winter ranges. Stock were ill-nourished and went into the winter season in poor condition. Moreover, eastern and southern stock arriving in late season were not adapted to the climate of the plains and did not go through the first winter safely. All business was conducted on the assumption that the winters would be "open". Then came a series of severe winters, sudden and devastating spring snowstorms and blistering summer droughts when grass was so short and supplementary feed so scarce that cattle were forced on the market at reduced prices. The winters of 1884-85 and 1886-87 were especially severe. Livestock perished by the thousand and it is said that in some instances not a steer was left to represent the brand of the owner. Starvation of cattle followed severe droughts in 1886-1890. Financial confidence, which started to wane in 1885, was soon completely lost. Loans were called and credit liquidation brought forced sales and bankruptcy (7).

Throughout the boom period there were some, however, to whom cattle raising was more than a wild adventure for big stakes. These men felt the necessity for providing a dependable forage supply and purchased land in an effort to prevent summer use of range suitable for winter grazing. They also realized that effective control of their range was tied in with control of the available stock water. Lands along streams where cattle could water and where wild hay could be grown were acquired. It was not always necessary to purchase large acreages; effective control often could be had merely by owning a few forties strategically located to control all or most of the stock water and the surrounding public land could then be
used just as though actually owned by the stockman. Legal possession was essential to permanence in the right to use such key tracts. The 160-acre homestead law was the best way out and cowhands were hired to file on these key tracts and for small sums turn them over to their employers. State lands were leased and strategically grouped through political influence. In one way or another, through outright purchase if necessary or by other means if practicable, range holdings were blocked up. Ownership of land was accompanied by higher grades of livestock; purebred bulls (Shorthorns at first, but after 1887 Herefords, which had proved more hardy and also earlier in maturing) were introduced. This use of better stock was in turn accompanied by the use of shelters; death by exposure of a Texas cow worth a few dollars had not been serious but that of a $300 bull was avoided by providing shelter and feed. Thus the combination of hard winters, dry summers and a market collapse began gradually to change the range-cattle industry from an adventure into a business.

Just when security in the ownership of cattle was becoming established and cattlemen were learning the necessity for welding land to livestock to insure dependable forage supplies and proper range use, a tremendous and rapid increase in sheep stirred up again the struggle for range. Sheep numbers quickly rose from a comparatively small figure to veritable hordes. (From about 110,000 in 1880 to over 2,000,000 in 1886.) Vast numbers of sheep appearing almost without warning on fully used cattle ranges not only aroused a deep resentment on the part of the cattlemen but had a dire effect in causing even further exhaustion of the range forage. Because of the close herding that was practiced sheep cropped the forage to the very roots and still further damaged the range by trampling. Sheep were crowded right up to ranches and settlements and since cattle fences did not keep out sheep, sometimes even hay fields were invaded. Cattlemen resorted to forco in many localities, sometimes scattering bands of sheep or driving them into ravines or over precipices. In northwestern Colorado residents still re-member vividly the "Winchester line" set up in southern Moffat County which no sheepman dared cross. The sheepmen, however, were quite as robust frontiersmen as the cattle growers and the cattle-sheep feuds waxed hot. Only after both cattlemen and sheepmen were convinced by the community that violence brought retribution to both contestants did the feuds cease.

The outcome of this relentless competition for range was complete utilization of forage; the only way to prevent another outfit from obtaining a given range was to strip it bare of forage. Depleted and restricted ranges, with the resulting increased expenses, skimmed off most of the profit. Wool prices dropped during the panic of 1893 and sheep could scarcely be given away. The decreased value of wool and the rising demand for lambs (beginning about 1900) brought about a marked reduction in wethers and consequently eliminated the worst form of range use by sheep. After 1915 the open range herds consisted largely of ewe-breeding stock. The market-lamb industry with its heavy investment in good breeding herds forced the sheepmen to avoid range-use difficulties and to seek sure feed. The sheep industry then took on two distinct aspects: (1) market lambs as a
major product, supported by heavy investments in land and facilities; and
(2) wool and range lambs combined with a smaller investment. Transient, nomadic sheep outfits decreased in number and range use by sheep soon became restricted to definite areas with range forage supplemented by feed from cultivated land. The sugar beet industry began in north-central Colorado in 1899 and the existence of a plentiful supply of beet tops and pulp encouraged a rapid and large expansion in lamb fattening. Whereas wool had once been the chief source of revenue from sheep, market lambs now became the mainstay of the sheep industry.

The creation of the national forests shortly after 1900 greatly stabilized range use and livestock production. Having a definite range allotment with from 3 to 5 months of dependable summer food helped the stockman to make the adjustments necessary to supply feed for the remainder of the year.

The World War again intensified range use by bringing about a great increase in numbers of livestock stimulated by rising prices and war demands. This led again to overuse of range forage speedily bringing to recover from past misuse. Again, as in the boom of 1883, easy credit led to overborrowing. Owners were making so much paper profit that overinvestment in livestock, land and improvements resulted. But the bottom soon dropped out of the market--secured wool, for example, was $2.05 a pound in March 1920 but dropped to 26 cents in August 1921--and both sheep and cattle growers lost heavily by liquidation and foreclosure.

After this collapse, livestock prices, along with those in other industries, rose sharply to the 1929 crest. Then followed another shrinkage in land and other values and the break in prices prevented disposal of livestock at prices even approaching production costs. Lambs and ewes brought only a dollar a head in some localities, there was no market at all in other places and, as a consequence, sheep numbers greatly increased. A similar situation prevailed in the cattle industry.

With large increases in numbers of livestock brought about by the War and still further increases resulting from a broken market the range became overstocked with livestock. Then followed the great drought of 1930-36, culminating a 10-15 year dry period. The plains section of the State was especially hard hit by the drought. Once more, herds were mortgaged to buy feed and inability to repay loans brought about an increase in bankruptcies despite the fact that banks generally were trying to avoid foreclosure on farms and ranches.

The story of the range industry in Colorado would be incomplete without mention of the stockgrowers' associations and their attempts to improve the lot of the stockman. The oldest of these organizations is the Colorado Stockgrowers' Association which was formed in Denver January 9, 1872, and is still going strong. In January 1898, the National Stockgrowers'
Association held its first meeting in Denver; differences of opinions among the members led to the organization in 1901 of the American Cattle Growers' Association in Denver, but in 1908 the two associations combined to form the American National Livestock Association which is still in existence. These associations brought the stockmen together to discuss problems of mutual concern, were active in promoting legislation needed for the protection of the industry and encouraged the improvement of herds. The first cattle show was at the second annual fair of the Colorado Agricultural Society in Denver during October 1867; the National Exhibition of Range Cattle was held in Denver in January 1899; and the present big annual exhibition, the National Western Stock Show, was started in Denver in 1905. (7).

Both the range itself and the livestock industry have shown great powers of resilience. After each shock of drought or depression new feed supplies have been found, at first by seeking new ranges but later by growing hay and other forage crops and by supplementing range forage with grain, cottonseed cake and other concentrates. Improved breeding of livestock and other adjusted production practices have helped to offset the increased feeding and other management costs. How rapidly the industry will recover from the latest onslaught on the forage resource, when both abnormal numbers of livestock on the range and long-continued drought combined to destroy the range plants, remains to be seen.

PRESENT RANGE INDUSTRY IN COLORADO

Extent and ownership of range lands

Approximately 50 million acres are available for range livestock production on the 66.3 million acres of land in the State. Sixteen and nine-tenths million acres of this range area are Federally owned or controlled, of which 9.2 million acres of grazeable land are in national forests and 6 million acres in public domain grazing districts. Indian lands and unreserved public domain with about half a million acres each and 0.7 million acres in other categories make up the remainder of Federal holdings. State-owned range lands total about 3 million acres. Thirty and one-tenth million acres of range lands are privately owned; of this, 10.8 million acres are open range 4/.

Types of range lands

There are three broad types of range land in Colorado, varying as to topography, altitude, and climatic conditions. These are the Great Plains, the mountain region and the semi-desert areas. The plains area

4/ From unpublished tables prepared by the Forest Service in assembling material for publication of Senate Document No. 399, "The Western Range".
extends from the eastern border of the State to the foothills of the Rocky Mountains. The mountain region occupies the high mountain range passing in a north-south direction through the western half of the State and includes a western slope section and an eastern slope. The semi-desert type chiefly extends from the mountain foothills to the west border of the State, although including also some large parks in the intermountain section.

The plains area is comparatively level at an approximate elevation of 3,500 feet to 6,000 feet. The northern part drains into the Platte River, the middle into the Republican River, and the southern part into the Arkansas. The normal annual rainfall averages about 15 inches, with the annual variation from 12 to 18 inches. The so-called "dust bowl" at the extreme southeastern corner of the State has an annual precipitation of less than 15 inches. Most of the area is range land; only 25 percent is crop land. Dry farming has proved largely unprofitable because of the sparse and uncertain rainfall accompanied by low humidity, high temperature in summer, the prevalence of drying winds and high evaporation. The irrigated lands comprising approximately 1,650,000 acres (2) in the plains area occur chiefly in the north central part of the State bordering the mountains.

Crop farming in the plains area is largely in connection with livestock production. For supplemental feeding of livestock in connection with range grazing or fattening in the feedyard, the crop production is chiefly corn, grain sorghums, wheat, Mexican beans, Sudan grass and alfalfa. The production of wheat and corn in good years as a cash crop adds to the income above the requirements for livestock feeding.

In the mountain region, characterized by rugged mountain slopes interspersed by wide valleys of meadow or park, the altitude runs from approximately 6,000 feet to 14,000 feet. Main drainages of the eastern slope are into the Platte and the Arkansas Rivers and of the western slope into the Colorado River. The normal annual precipitation averages 25 inches, with the annual variation from 16 to 40 inches. An abundant rainfall results in luxuriant growth of succulent forage during the summer months. A plentiful supply of moisture produces a good crop of hay in the meadows or parks but the shortness of season because of altitude and the early appearance of frost prevents a successful cultivation of crops other than hay. The mountain slopes are chiefly of grazing value and the mountain valleys or parks for the production of hay or for pasture. The production, consequently, is chiefly of livestock with a dependence on the mountain area for summer pasture and the valley hay production for the winter feed.

The semi-desert ranges, chiefly at the western and southern borders of the State are similar to the plains area. The area is level to rolling and varies in altitude from approximately 5,000 feet to 9,000 feet. The annual rainfall is from 7 inches to 15 inches. On the whole it is definitely semi-arid and of chief value for grazing. Attempts at dry farming have proved futile and cultivation is doomed to failure because of lack of water.
In an exceptional year of heavy precipitation some crops may be grown, but for the average year and in the long run the area is simply range and is not suited to cultivation. Due to lack of water in summer, it is chiefly of value for grazing in the spring, fall, and winter when snow is on the ground to provide water for livestock.

Types of range vegetation

Within the three broad types of range land in Colorado there is a considerable diversity of vegetation (see figure 1). Large areas are dominated by one or a few species of plants; equally large tracts are dominated by other plants. In a general way, these characteristic range vegetation types are largely a result of altitude and climatic conditions and can be grouped into five broad classes:

- Plains grasslands
- Open forest ranges
- Sagebrush-grass types
- Pinon-juniper woodland ranges
- Salt-desert shrub types

The plains grasslands occupy the treeless plains in the eastern part of the State. These ranges are characterized by a cover of various "shortgrasses", principally blue grama and buffalo grass, and rarely have brush or browse plants. There are about 27.5 million acres in this type which unquestionably is the most important of all the range types in the State both because of its large area and because of its high potential grazing capacity. Most of the type is privately owned.

The open forest types are found in the mountainous portions of the State. They include the ponderosa pine-mixed grass, spruce-fir and mountain meadow, aspen and lodgepole pine, and the chaparral (oak and mountain shrub) sub-types. The open forest types probably rank second in grazing capacity. There are about 9.2 million acres in this type. These are the summer ranges; most of them are in Federal ownership.

Third in importance because of its potentially large grazing capacity is the sagebrush-grass type. There are large areas of this type in the northwestern quarter of Colorado but it also occurs extensively in the mountainous central part of the State. This is principally a browse type although originally a large amount of grass was intermingled with the shrubs. It is a valuable range when its productivity is conserved. There are about 5.9 million acres in the type, chiefly in Federal ownership.

The pinon-juniper woodland type of range is mostly in the extreme western part of the State but the type also occurs over fairly large areas along the foothills in south-central Colorado. Interspersed with the low-crowned trees of this type are various browse plants and, before the range was used severely, many palatable grasses. It is used chiefly as spring-fall range and in some places as winter range. There are about 4.7 million acres in this type, largely Federally owned.
Only a few sizeable areas of the salt-desert shrub types occur in Colorado; these are in the extreme western and southern parts of the State. This is a browse type, in some places dominated by shadscale and elsewhere by greasewood. It is used as winter range. There are about 2.7 million acres in the type, most of which is in Federal ownership.

Seasonal use of range lands

Nearly all of the range area can be utilized at some time of the year by one or more classes of livestock. The division of the grazing ground into summer, spring, fall, and winter range conforms to the variation in the kind of forage and character of site. The drier ranges at lower elevations which are as a rule comparatively free from snow may be used for the maintenance of livestock during the winter season. The higher mountain ranges which are more abundantly supplied with water and succulent forage, are deeply covered with snow in winter and can be grazed to best advantage only in summer. The intermediate range of suitable exposure between the lower and high elevations may best be used for spring, fall, and summer grazing by cattle. Portions of the lower altitude ranges such as the plains or prairie area, having an abundance of nourishing grasses and available water in summer as well as in winter, may be grazed yearlong.

About half of the range area in the State is grazed year-long (i.e., 8 to 12 months). Approximately 35 percent of the ranges are used only during the summer months. Spring-fall and winter ranges each occupy about 7 or 8 percent of the total range area. In general, the plains grasslands are the year-long ranges, the open forest types are the summer ranges, and the browse and woodland types are the spring-fall and winter ranges.

Number of livestock

Aside from big game animals which are chiefly found in the mountains, about 75 percent of the range area of the State is grazed by cattle and horses; sheep and goats use the remaining 25 percent.

It is impossible to state accurately how many head of livestock are grazed on Colorado ranges. An estimate is given in table 1 but this does not include the large numbers of sheep and cattle (particularly sheep) which are brought into the State for several months of grazing each year and are taken out of the State again. For example, it is estimated that 141,000 sheep from Utah and Wyoming enter the Yampa River drainage at the northwestern corner of the State each year as shown in figure 2. Moreover, although definite information is lacking, it is known that livestock enter the State at other points, particularly from Utah and New Mexico into the south and southwest parts of the State.
Table 1.- Approximate number of livestock in Colorado, January 1, 1937.

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle and calves</td>
<td>1,450,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Milk cows</td>
<td></td>
<td>264,000</td>
</tr>
<tr>
<td>Horses, mules and colts</td>
<td>271,000</td>
<td></td>
</tr>
<tr>
<td>Hogs</td>
<td></td>
<td>260,000</td>
</tr>
<tr>
<td>Sheep and lambs</td>
<td>1,640,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,361,000</td>
<td>1,644,000</td>
</tr>
</tbody>
</table>

*Denver Record Stockman, page 4, January 7, 1937.*

In addition to domestic livestock, big game also use the range. In 1936 big game animals in Colorado numbered 132,052 as shown in table 2.

Table 2.- Approximate number of big game in Colorado, January 1, 1937.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antelope</td>
<td>820</td>
</tr>
<tr>
<td>Black, brown and grizzly bear</td>
<td>4,239</td>
</tr>
<tr>
<td>Mule deer</td>
<td>103,910</td>
</tr>
<tr>
<td>Elk</td>
<td>20,093</td>
</tr>
<tr>
<td>Mountain sheep</td>
<td>2,950</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>132,052</td>
</tr>
</tbody>
</table>

*Estimated by U. S. Forest Service.*

The two distinct phases of the livestock industry

It is necessary to keep in mind that there are two distinct divisions of the livestock industry in Colorado: (1) raising of livestock on the range, and (2) lamb and steer fattening on farm feedlots during fall and winter.

The stock-fattening phase of the livestock business is carried on mainly as an adjunct of crop production on irrigated lands. Cattle and
lambs are shipped in from the open range to the feedlots during the fall and are finished for the winter and spring markets by feeding hay, grain, cottonseed cake and sugar beet tops and pulp. Most of the feedlots are along the eastern edge of the mountains in the north-central and south-central parts of the State, although there is an increased tendency for establishment of feedlots on West Slope ranches. The hay and beet by-products are produced locally but much of the grain is shipped in as is all of the cottonseed cake. About a million head of lambs are shipped in and out of the feedlots annually; nearly all of these go to the Denver packing houses. These sheep come from local ranges; the feedlots also take many head from Wyoming, Utah and Idaho ranges. A very much smaller number of steers are fattened in Colorado feedlots—approximately 120,000 head were on feed in January 1937. The local feedlots cannot absorb all of the production of local ranges and Colorado cattle ordinarily go directly from the range to midwestern feedlots and packing houses. As a rule, stock feeders run no cattle or sheep on the range and own no livestock except during the few months of the year when crop production is impossible and they turn their efforts to feeding. The manure is used to fertilize the feeders' crop lands and many stock feeders feel that if they do no more than break even on their feeding in a poor market year they at least profit by saving the very appreciable cost of purchasing fertilizer.

This report is chiefly concerned, however, with the range livestock business proper, the raising of sheep and cattle on the range. This phase of the industry, in contrast to that of the feedlot, involves the yearlong handling of livestock. The animals are grazed mainly on the native vegetation of mountain and plain but if this is insufficient some supplemental feeding is necessary. The native vegetation is the pivot around which revolves the economic welfare of the range livestock business of the State.

Types of range livestock operation

In Colorado there are three types of livestock operation in which range use plays a major part. These are determined by location with respect to feed production and accessibility to available range. They are: (1) the year-long type of ranch in the Great Plains area of eastern Colorado, (2) the mountain type of ranch where the livestock have access to the national forests for summer grazing and are wintered in mountain valley meadows on alfalfa or native hay and, (3) the semi-desert type of operation where the animals are wintered in the semi-desert range of western Colorado and summered either on the national forests or on private lands within the State or in the adjoining States of Utah and Wyoming.

Plains type of operation.— This type of operation applies to the plains grassland of the eastern half of the State where the annual precipitation is so low as to discourage crop production. Livestock raising and feeding is the dominant industry. In this area, practically no crops
are grown without irrigation, except a little corn, kafir or sorghum for forage, usually on land which receives flood water from higher lands or possess other favorable conditions. Crop production is precarious and there are frequent failures. Attempts at dry farming over much of the area has resulted in the eventual abandonment of thousands of acres to slow recovery to native pasture for which it is better suited. In south-eastern Colorado it is estimated that in certain areas at least 50 percent of the dry farm land is abandoned.

In this semi-arid grazing area the vegetation is largely blue grama and buffalo grass. The foliage of these two species cures in the late summer, forming a natural hay that retains most of its nutrient through the winter. Thus, grazing on the open range forage for 8 to 12 months of the year becomes possible and is the common practice. For the shorter period supplemental feeding is made on hay or other cultivated crops and on cottonseed cake or other concentrates. The essential production, however, to enable a profit, relies on the cheap feed furnished for the greater part of the year on the native ranges.

Mountain type of operation.— This type of operation applies to the valley ranches within or adjacent to the forested mountain area of the west and central part of the State. The valley meadows or parks produce an abundance of either native or tame hay on which livestock are fed in winter. The mountain ranges, largely included within the national forests, furnish summer grazing. Because of early and late frosts which prevent the growing of cultivated crops, the irrigated mountain meadows are useful chiefly for hay production and grazing. For profitable production in this area, the availability of spring, fall and summer range in the national forests becomes an essential part of the year-long operation.

Semi-desert type of operation.— This type of operation involves sheep principally, is largely of nomadic character and applies to the semi-desert ranges of the western and southern parts of the State. Sheep are wintered on the dry ranges when snow is available to provide water for the animals. This range at the extreme western and southern parts of the State is largely included within the public domain grazing districts. Herds of sheep from Utah, Wyoming and New Mexico use the area in common with those from Colorado. For summer, these herds graze either on the national forests or on privately owned or leased lands. Some supplemental feeding is required when the animals are on the winter range. Essentially the operation comprises year-long grazing and the reliance is almost wholly on the cheap feed furnished by range forage.
THE IMPORTANCE OF CHEAP RANGE FEED

The range livestock operator in Colorado is absolutely dependent on the existence each year of an abundant new crop of natural feed—grasses, weeds, and browse—produced without irrigation or artificial cultivation of any kind. He must have sufficient range forage to produce animals in good condition. Condition of the livestock at the time of sale means very often the difference between profit and loss. A difference of a few cents a pound in the selling price is a vital consideration. An abundance of good range forage enables him to sell his animals at a profit. Insufficient range forage, on the other hand, means that the animals must be fed more hay and concentrates. This increased supplemental feeding is an added production cost which reduces the margin of profit. The history of the industry shows that over and over again range livestock operators suffer large financial losses whenever the natural forage resources are depleted and extra supplemental feed must be purchased. The margin between profit and loss in the range livestock business is too small to allow the operator to do much more feeding than is absolutely necessary to carry his stock over winter or drought periods and to help condition the animals. Moreover, the cornbelt farmer of the Midwest is a direct competitor of the Colorado stockman and has two advantages: he does not have to pay transportation on corn or other grain (and fodder is plentiful and costs little) and he has to pay only about one-fourth as much freight as the Colorado stockman to get his animals to market. About the only way the Colorado stockman can meet this competition is to have lower production costs. And the best—often the only—chance to reduce production costs is to save on the cost of supplemental feeding. An abundant supply of good natural forage is the only answer.

FORAGE SITUATION ON COLORADO RANGES

This report would be far easier to prepare if it could truthfully be said that the native forage on Colorado ranges is both plentiful and good. Unfortunately, the cold fact is that present forage conditions are far from encouraging. It should be understood at the outset that the purpose of this report is to present facts that can be proven and which need to be faced frankly if the livestock industry is to prosper financially. It should also be clearly understood that it is not the purpose of this report to act as judge and jury to fix the blame for present range conditions. It does not greatly matter who was responsible; the sensible thing to do is to look at the situation realistically and if range conditions can be improved to do something to improve them.
Evidences of present unsatisfactory range forage condition

The evidence of unsatisfactory condition of the range is seen in replacement of perennial palatable species by less valuable plants, in thinning of the vegetative cover, increase in number of poisonous and noxious plants, eroding of soil and lowered grazing capacities.

For example, a large proportion of the short grasses in the original plant cover of the plains area has been replaced by weeds and shrubs of low palatability, such as sand sagebrush, Russian thistle, sunflower, asters, goldenrod, and peppergrass. In eastern Colorado the worthless snakeweed, gumweed, and cactus now dominate many areas. Where mixed prairies once existed along the Arkansas River, the grasses have almost completely disappeared and sand sagebrush, Russian thistle, and yucca now constitute 60 percent of the total plant cover. In parts of eastern Colorado, grasses once comprised 86 percent of the plant cover but now constitute only 56 percent of the vegetation, whereas weeds have increased from 14 to 34 percent (8).

Accompanying this decrease in forage quality is the even more serious decrease in volume of forage through thinning of the entire plant cover. The vegetation in general is only half as thick as it was when the white man first began to use the range for pasturage. The recent drought is responsible for a certain amount of the thinning. It is worth noting, however, that small remnants of the shortgrass range, which have been conservatively grazed during the drought period, now have nearly ten times as thick a plant cover as adjacent areas exposed to the same drought conditions but long overgrazed by livestock.

The original plant cover or sod served as a natural factor of protection in holding the soil together, in preventing rapid run-off of water and washing or blowing away of the soil and in retarding or lessening the damage by erosion and floods. Removal or thinning of this sod through cultivation and overgrazing has resulted in lowered productivity of the forage cover and a loss of soil materials. This is strikingly illustrated in southeastern Colorado, the "dust bowl" area, where it is estimated the forage has lost 86 percent of its former value and the blowing of soil has become a common occurrence.

In many places in Colorado damage to the range through overgrazing on public domain and private lands is evidenced by sheet, shoestring, gully, and arroyo erosion. Roads, bridges, fences, and ranch buildings have been damaged. The work of the Soil Conservation Service and Resettlement Administration and the range improvement program of the A.A.A.A. are all based on recognition that range deterioration has occurred and that a remedy is required.

It is estimated that many ranges in Colorado have scarcely a fourth of the grazing capacity that could be obtained under good management. The estimated grazing capacity of the original plant cover in the principal
vegetative types and the approximate reduction in forage value when compared with present conditions is given in table 3 (8).

Table 3.- Estimated grazing capacities of major range forage types in Colorado

<table>
<thead>
<tr>
<th>Vegetation type</th>
<th>Estimated grazing capacity:</th>
<th>Reduction in forage production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Original: Acres per cow month: Percent</td>
<td></td>
</tr>
<tr>
<td>Plains grassland</td>
<td>2.1 : 4.1 : 49</td>
<td></td>
</tr>
<tr>
<td>Open forest</td>
<td>4.0 : 5.9 : 33</td>
<td></td>
</tr>
<tr>
<td>Sagebrush-grass</td>
<td>2.9 : 8.9 : 67</td>
<td></td>
</tr>
<tr>
<td>Pinon-juniper</td>
<td>3.4 : 8.4 : 60</td>
<td></td>
</tr>
<tr>
<td>Salt-desert shrub</td>
<td>5.2 : 17.8 : 71</td>
<td></td>
</tr>
</tbody>
</table>

Causes of present forage conditions

The present unsatisfactory condition of the range resource in Colorado is due to a number of primary causes. These include (1) excessive stocking, (2) unsound management practices, (3) unsuitable land policy, (4) financial handicaps, and (5) climate.

Excessive stocking.- The early day stockman in Colorado held to the belief that there was not a sufficient number of cows in the country over to eat all the grass that was growing on the range. Most of the lands were open public domain, and some were grants held by private individuals. Very few owners were on the ground in person, however, and there was nothing to prevent cowmen from appropriating the range, arbitrarily laying off range boundaries and claiming them under their so-called "range rights."

As more cowmen came in, the range was divided and the division lines agreed on between them. As still other cowmen appeared, the range was further divided until it was considered fully occupied. No one would admit the range would ever play out. The range was free—there was no rent to pay, and not much in the way of taxes.

Stockmen bought to the full extent of their credit on a rising livestock market and at high rates of interest. Nearly every stockman was in the market for more cows. There was an eagerness to get rich fast with its consequent tendency to overstock and overgraze the range.
The early settlers who were the users of the open range had very little or no conception of the species of forage plants covering the range originally, their behavior, their requirements for reproduction and continued growth, and the damage taking place by overstocking. There was no attempt to measure the grazing capacity except on the national forest ranges, or on those areas that were finally included within the limits of the national forests. Particularly on the public domain, private and State ranges, no practical remedy was being sought to correct the damage from excessive use. Immediate profit loomed so large that care and restraint in the use of the range resource seemed far-fetched and visionary. The conservation of the forage and soil resource was largely in the background. Free and unrestrained use had become the traditional attitude.

Unsound management practices.—To the western pioneer the grazing of the western range was an entirely new form of agriculture. His background was frequently that of traditional knowledge of crop agriculture developed under European conditions or adaptations of this knowledge as worked out in the east and middle west. Accordingly, under the greatly differing conditions of climate, vegetation, soils, and the handling of grazing animals on the western range, he was handicapped from the start. It took time to learn and adjust practices to the new conditions. In so doing he was bound to make serious mistakes, especially in view of an absence of the benefits of technical knowledge. In many cases overstocking took place and unsound management practices aggravated the condition of overgrazing. These practices were poor distribution of livestock, concentration on key areas such as mountain meadows and around watering places, grazing at the wrong time of year, faulty balance between classes of animals and type of range and grazing two or more classes on ranges already overstocked with one. Even if he realized the injury that these practices were doing to the range, the stockman often was prevented from correcting the situation under the compulsion of other causes, such as economic pressure because of poor markets or during emergency periods of feed scarcity, which stayed his hand.

Unsuitable land policy.—An unsuitable land policy or lack of suitable land policy to fit conditions in the semi-arid and mountain region of the West, including Colorado, has been a major factor in reduction of the range forage resource. Many attempts at dry farming especially have proved unsuitable. The belief in universal private ownership of land, the application to this dry region of lands laws designed to fit humid conditions, the failure to classify lands according to their highest use, and interpretation and administration of the statutes all played a definite part.

The range lands in Colorado were originally Spanish land grants or public domain. From this simple division of lands there were carved out of the public domain a large number of private land holdings under the various acts of Congress. Chief among these were the 160-acre homesteads, 160-acre pre-emptions, 320-acre desert lands, lands deeded under the timber and stone act, the 640-acre grazing or range homestead act, lode and placer
mining laws, the timber culture and forest reserve lieu selection land laws. The inroads into the public domain made by the railroad land grants, when added to the vast area deeded to private owners, materially reduced the remaining available and usable public lands for open range. Furthermore, the ownership pattern of range lands within the State as a result of the land disposal policy of the Federal Government has become exceedingly complex and confusing.

The inadequacy of the land-disposal policy as applied to Colorado is seen in the abandonment of dry land farms and the frequency of tax delinquency. In 1932 nearly 61 percent of the privately owned farm and ranch land (approximately 21,760,000 acres) in Colorado was delinquent for general property taxes (9). The complexity of ownership of range land and the accompanying deterioration of the range resource presents a major problem to the livestock industry and the State. The rehabilitation of depleted range land and the restoration to sod of abandoned dry farm land are phases of the problem requiring attention.

Financial handicaps.- The stockman was not entirely a free agent in manipulating more suitable management of the range. Lack of proper credit facilities and marketing difficulties were handicaps. He was faced with the necessity of producing on cheap feed in order to successfully compete with his middle-western competitor who had the advantage of nearness to market and low freight cost. Further, he was up against unfavorable credit facilities—easy during boom periods but almost impossible to get during depressions, thus resulting in dumping stock in glutted markets or holding them on ranges already overstocked. Still further, he was subject to short-term loans at interest rates often as high as 10 or 12 percent which increased his costs, reduced profits, and added to the hazards of the industry. Widely fluctuating markets from year to year and almost from week to week have added to his financial difficulties. As a result, the stockman has endeavored to break even by crowding more and more stock on the range with consequent increased deterioration. It would seem from this, in part at least, that the stockman has been the victim of circumstances far beyond his control.

Climate.- The history of the livestock business shows a continual struggle against the elements. Records of severe storms and accompanying stock losses are scattered all through the old histories of Colorado. Severe winters have occurred in every decade since 1860. Especially heavy losses of cattle are recorded for the winters 1860, 1867, 1871, 1885, 1890, 1899, 1910, 1915, and 1920. Drought also is a recurrent visitor particularly in the plains area. There were disastrous droughts in Colorado in 1879-80, 1888-90, 1893-94, 1903-04, and 1930-35.

The volume of range forage produced depends especially upon the amount of precipitation. The reduction in forage production in a drought year as compared with favorable years may be as much as 50 percent or more over large areas. Recovery in production even under the most favorable climatic conditions is not complete in a single year and under average
conditions may require from 3 to 5 years. Under these conditions, unless drastic reductions are made in the number of livestock placed on the range to meet the decreased forage production, overgrazing of forage is an inevitable result.

ECONOMIC CONSEQUENCES OF THE PRESENT CONDITION

Instability of industry

As a consequence of the present condition brought about by the many factors that have been discussed, the stability of the livestock industry is seriously threatened. Reduced production of cheap range feed is at the root of the difficulty, enhanced by unfavorable economic conditions. The inflated prices paid for land, high interest rates on short term loans, the distance from market and thus high cost of freight, the high cost of supplemental feed and the periodic market collapses all serve to make the range livestock industry precarious. The unfavorable financial situation and the uncertainty of securing an adequate price for the product makes all the more necessary a sustained production of cheap range forage.

A combination of adverse factors such as drought and depression may seriously impair range livestock production. During such periods some ranchers have been forced out of business, many hold on precariously, while others who have kept adequate reserves continue in a position for balanced operation. Costs must be cut to a minimum and profitable production must await a favorable upswing in forage production and livestock prices. In such instances, the availability of a reserve of cheap range feed through having maintained a sustained and adequate production of range forage is the best insurance against bankruptcy.

Social and economic losses. Agriculture in Colorado is closely associated with the raising of feed and grazing of livestock. To this extent the farm and ranch products, some of which are fed to livestock, are tied into the range forage which is used to supplement these farm products. Properly handled, the range vegetation is renewable and hence must be considered as a permanent resource. Its unwise management results in loss to agriculture generally through reduced range capacity to carry livestock, removal of the productive top soil and lessening the value of lands for continued production and profit.

Damage to irrigated farms from silting of reservoirs and ditches is serious. The greatest permanent loss, however, is the continued eroding of the rich top soils caused by rapid run-off and floods. Abandonment of many dry land farms in the plains area of Colorado is expressive of land misuse and the disastrous consequences of such misapplication in the form of human wastage and range land destruction.

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Range deterioration has had a long series of adverse effects on both crop growing and livestock raising. It has been one of the principal factors causing unstable communities. It has resulted in abandonment of farms, in heavy damage to beet crops due to beet leaf hopper coming in from depleted ranges where the hopper breeds in the Russian thistle and other detrimental weeds, in forcing the stockmen to the excessive use of supplemental crop feeds, and in reduced calf and lamb crops and other losses because of too little range forage. It has increased the stockman's costs of operation and lessened his chances for profitable competition against the Mid-west producer. Thus, the restoration of ranges and their maintenance in high productivity of cheap feed is needed to offset the adverse effects and to provide the greatest possible security for the rancher and the community.

MAJOR PROBLEMS OF RANGE USE

The outstanding problems of range use in Colorado are to find a way to coordinate range use in the national forests with livestock production on lands outside the forests, and to discover how to most profitably use areas outside the national forests (e.g., the eastern plains area and the semi-desert areas). The problem includes sub-marginal operations inside national forest boundaries and those adjacent to the national forests.

The problem is accentuated by over-grazed winter range on public domain and over-production of hay on valley ranches. Excessive stocking on winter, spring and fall ranges off the national forests and the large production of hay and livestock on the ranches result in heavy pressure on the forests for summer range and overstocking of spring, fall and summer ranges outside the national forests. Furthermore, unrestricted and excessive stocking of winter range by sheep, setting up a corresponding and greater demand for summer range has resulted in competition with cattle for summer range on leased homesteads, formerly grazed by cattle. These homesteads invariably lie below the forests and were taken up chiefly under the 640-acre grazing homestead act. Displacement of cattle on these natural cattle areas by sheep has created additional pressure on the national forests for use of summer range by cattle.

In the eastern plains area and on some portions of the western semi-desert range, lands taken up for dry farming have proved unsuccessful and have been abandoned or have been acquired by the Federal Government through the Resettlement Administration. The question of rehabilitation and future use of such lands is a major problem in economic range development.

Excessive stocking on public domain and large hay production need adjustment. The solution will probably be a shift in the use of hay lands for grazing. The philosophy has been to raise all the hay possible in
order to feed as many livestock as possible. This has created heavy
gressure in the proper administration of the national forests (the main
summer range) because of the heavy demand for summer range by cattle and
also the need for range by sheep. As stated, it has also caused overgrazing
of ranges outside the national forests especially spring and fall range
near the ranches. Since stockmen were unable to obtain range on national
forests they turned their stock on the public domain already overstocked,
and thus augmented overgrazing. The main difficulty is too many stock on
winter range. The rate of stocking on winter ranges has always been far
in excess of corresponding spring, fall, and summer ranges. The demand
on the summer range has resulted in localized overgrazing by cattle, due
to forced mishandling of such stock in attempts to use range not suited
to cattle grazing. But generally speaking, the open forest ranges are not
seriously overgrazed.

The situation as presented suggests the need for a range research
program that will consider problems first of all from a viewpoint of the
State as a unit, and then the detailed phases as applying to individual
regions or areas in the State. The more important regions that need early
attention are: (1) the eastern plains grassland; (2) the open forest
summer range; (3) the semi-desert sage and shrubland ranges. The relation-
ship of these regions to each other from an economic viewpoint needs to be
considered as well as the best use to which each region within itself may
be put, such, for example, as year-long grazing or winter versus summer
operation on the plains.

The whole course of sub-marginal operations in the mountain country,
and their dependence on the national forests for range needs thorough inves-
tigation. The parts that use of the public domain for winter range and that
supplemental feeding play in the livestock operation should be determined.
This should be observed in comparison with operations on well managed,
privately owned lands. It also is desirable to determine what constitutes
an economic unit, i.e., the number of stock, amount of range land needed,
and requirements for supplemental feed for winter and in case of drought.

The detailed phases of range management requiring study, aside from
the economic, are: (1) the numbers and kinds of livestock that the various
ranges should carry for restoration and maintenance of forage; (2) the
degree of use to which each important species and each major forage type
may be subjected without undue injury; (3) the best season and length of
use of the range so as to maintain sustained forage yield; (4) development
of methods for artificial and natural seeding in rebuilding a depleted
vegetative cover; (5) poisonous and obnoxious plant eradication; (6) studies
of plant succession to determine forage trends and furnish indicators of
range conditions; (7) analysis of predator and rodent relationships as
effecting rodent control and forage production; (8) investigation of the
class of livestock to determine particularly the possibility of interchange
in use of range for improvement of forage cover; (9) forage surveys and
continued inventory and observation of range conditions to record problem
areas and note forage trends under the kinds of management applied.

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Study of the general problem, which is essentially economic, may be done by observations on representative areas within the State, such as ranch operations on the eastern slope within and adjoining the national forests, winter range operations on the western slope, and hay ranch operations in mountain valleys. Economic studies should be made on a large enough scale to assure reliable results.

The detailed phases of range management will require study on experimental ranges. One experimental area is needed in the plains grassland section, another in the forest section, and possibly a third in the semi-desert section. Of first importance is an experimental range in the plains grassland type. Pertinent facts determined on these experimental areas as to grazing capacity, utilization, and the like will apply to the major problem in considering the best range use and the needs for adjustment to effect the most satisfactory unit operation, whether sectional or regional.
LITERATURE CITED


(3) Industries of Colorado. A series of radio talks about various Colorado industries, tenth series. The University of Colorado quarter hour presented over Radio Station KOA, February 2, 1936, to May 3, 1936, University of Colorado, 1936.


Note: Acknowledgment is made of material from "The Western Range" (Senate Document No. 199) used in this report without quotation marks to indicate its source. The section on history of range use was largely taken from a corresponding section in Senate Document No. 199, as were pages 15-18 dealing with evidences of present unsatisfactory forage conditions and the causes of these forage conditions.
Figure 2—The complexity of range use resulting from interstate and seasonal movement of livestock is illustrated by this actual example from Northwestern Colorado. (From a chart in "A Survey of Range Economic Conditions and Distribution Problems, Yampa River Drainage, Colorado, Region Two, 1935-1936", a report prepared by L. H. Douglas, P. V. Woodhead, and H. E. Schwan).