NUMBERS OF LIVESTOCK WITHIN RANGE AREA

In order to get at the evidences of excessive stocking, it is necessary to consider first the numbers of livestock which have been carried within the range area.

The approximate numbers of livestock, expressed in animal units, from 1870 to 1935, within the 11 far-western States and the range portion of the six Plains States, are shown graphically in figure 52.

![Graph showing trends in total animal units in the range country.](image)

Even in the face of severe losses in critical periods, numbers of livestock show a rising trend for the first 48 years. Starvation and winter losses of the eighties were soon forgotten; those stockmen who still had a remnant on which to build and new settlers with capital brought in from the East forced numbers on upward. Livestock were pushed back into the less accessible mountain ranges and into the poorly watered desert areas. The depression, drought, and lack of range feed of the early nineties again took their toll and halted the upward trend for a few years, but another upward surge, principally in sheep, brought a new high peak about 1903.

A still higher peak was reached in 1915, the result of the World War urge for increased production and the encouragement of high

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The yearly estimates of numbers of livestock in the range area are derived from the published revised estimates of the Bureau of Agricultural Economics for the 11 Western States for January of each year from 1918 to 1933, and before that time, from unpublished revisions by that Bureau when available, and other similar revisions based on original published estimates of the Department of Agriculture and Census records. For the range portion of the six Plains States, the January 1 estimates for census years were determined by using a proportionate ratio of census numbers in counties in the range area to that for the whole State. Although these numbers cannot be considered as accurate for all years, they do show with reasonable accuracy the main trends for the period under consideration.

An animal unit for purposes of this report is considered to be one head of cattle, one horse, one mule, five sheep, five swine, or five goats. The ratio of five to one was considered a suitable average of the generally lower ratio between cattle and sheep on the range, which in places is found by the Forest Service to be as low as three to one, and the higher ratio between cattle and sheep in the feed lot used by animal husbandmen.
In the range portion of the Plains States, numbers on ranges reached an early peak of over 8.5 million animal units about 1900. After a decline of around 10 percent to 1910 a new peak was established about 1920 when approximately 9.5 million animal units were on these range lands. Since 1920 there has been a decline of about 24 percent, especially marked in 1934. These figures may not be an entirely true picture of range stocking in the Plains States because of a number of uncertain factors. There are, for example, large quantities of unrecorded grain and other feeds shipped into this area, an unestimated area of grain fields that are grazed in winter and as stubble, and some of the cattle recorded as on farms and ranges on January 1 are shipped out of the area in the spring. The difficulty of taking adequate account of these features in the Plains States tends to show larger numbers of livestock on ranges throughout the year than is probably the case.

In the 11 far-western States the peak of livestock on ranges was reached about 1890, when 12.5 million animal units were obtaining their feed from range lands, 88 percent of the livestock then in these States. By 1910, around 10.4 million animal units were on range, about 60 percent of the total animal units. Following another rise to 1920 there has been a declining trend to 1935 when about 10 million, 57 percent of the total animal units, were on range lands. Thus a net decline of about 20 percent has occurred on range lands since 1890.

Figure 53 brings out the decline which occurred in the stocking of range lands between 1890 and 1910, and again between 1920 and 1935. While the grazing of heavier animals, as a result of better breeding and other improved animal production practices, may account in part for these declines, they are also undoubtedly due partly to a declining range-feed supply caused by overstocking.

The rise from 1910 to 1920 represents primarily the increase caused by war demands and does not indicate that there was range forage available for the excess livestock. In fact there are many indications that excessive stocking became the rule. In western Texas, for example, the upward trend was abruptly halted in 1916 and 1917 when range conditions failed, starvation losses were widespread, and forced shipments of livestock were made as ranges became more depleted. Along the Texas & Pacific Railroad in the Trans-Pecos country, ranges presented a pitiful sight. Feed gone, carcasses of cattle in great numbers around water holes, and gaunt, starved animals still alive, their ribs all but protruding through the flesh—all these evidences told a tragic story of failure to keep numbers within safe limits of range-feed production.

The opening up of new areas by water developments, trails, and other means, has also been a factor in holding up livestock numbers on grazing range lands. At first the more readily accessible ranges were stocked. As high prices stimulated expansion or as exhausted feed supplies, especially during drought, compelled removal of livestock from overgrazed ranges, stockmen have drilled wells, constructed reservoirs, and made other improvements in order to utilize formerly unused or lightly used ranges. Such improvements expanded the range livestock industry to the point of compensating
for livestock decreases necessary on many overstocked and deteriorating ranges.

Even the decline from 1890 to 1935 does not in itself indicate that range feed would satisfactorily support the reduced numbers now grazing on ranges. Many herds are being carried on little more than a subsistence basis, aided by the feeding of concentrates. Under such conditions of excessive stocking, cattle, sheep, and especially goats, have continued to graze ranges after all palatable feed had been consumed. It has been necessary for the livestock to subsist almost entirely upon low-value plants such as the common sagebrush,

![Graph](image)

**Figure 53.—Range Versus Other Feed in the Far-Western States.**

Despite rapid stocking of range lands between 1870 and 1890, the declining trends in animal units on range from 1890 to 1910 and 1920 to 1935, indicate at least in part depletion of range due to overstocking. This indication is substantiated by the increasing use of expensive supplemental feed.

yellow brush, and weeds, which under conservative utilization would be grazed, but little except possibly in dry years.

The striking increase in livestock carried on feeds other than range forage shown in figure 53 is in itself an evidence of overstocking. Stockmen do not feed hay, costing $5 to $20 or more a ton, or costly concentrates, if adequate range pasturage worth $1 to $3 and often less for an equal feeding period is available. Winter feeding is expensive and ranchers are now compelled to rely largely on the cheap summer forage for profit.

**Variation in the Individual States**

The situation in the 11 far-western States as a whole is duplicated to a degree in most of the individual States. New Mexico, for example, illustrates an even more marked decline in numbers of live-
Jared G. Smith. Grazing problems in the southwest and how to meet them.

"The vast areas of grazing lands in the Southwest have long been justly famous, and the almost numberless herds of cattle and bands of horses raised and fattened upon the nutritious grasses of that region have enriched thousands of individuals and have been a source of great commercial wealth to the nation... The nature and extent of the interest here, make this region an especially important one in the line of grass and forage plant investigation. The carrying capacity has diminished fully 40 per cent through overstocking and bad management during the past fifteen years, and the grazing and forage problems of the region demand serious and careful attention.

"Before 1883 the ranges of central and western Texas were free to any man who chose to run stock upon them.

"In 1883 the Texas and Pacific Railroad was built through the heart of the range country, and there was an influx both of owners or agents of the

OVERSTOCKING THE RANGE

"There are many square miles of territory in the Southwest where the ruthless destruction of grass has been carried to the extent mentioned above... The chief cause of overstocking in the first place was the free-range system, under which lands owned by the State, public institutions, or corporations, under the common law and in the absence of the owners or their agents, were considered as commons upon which any man was free to pasture all the cattle or sheep which he could command. The holding or use of lands in common always results in rapine, because of the principle that what is everyone's property is no one's, and no one is responsible for its abuse and spoliation. No thought was given to preserving the inheritance of those who were to occupy the land in future years; it was every man for himself, and he was the best man who could put the most cattle on the ranges to eat the most of the free grass. The natural outcome of this was that the ranges throughout the entire region were overstocked... Overstocking not only causes loss of cattle and sheep from starvation in time of drought, but it causes the rapid extermination of the most valuable of the native grasses and forage plants. In any pasture the grasses which are first eaten down are those which are most nutritious or most palatable. Unless the pasturage is fostered and these best grasses are protected by resting or by artificial care and cultivation, they are soon reduced in number and become unimportant factors. They are prevented from ripening seed and are eaten so close that often the roots are killed by exposure. The first result of overgrazing is the disappearance of the best grasses, that is, a lessening of the potential carrying capacity of the pasture. If the best grasses cover 25 per cent of the range, the loss from overgrazing will be at least that amount. If the pasture is still overstocked, a similar process is continued with the remaining species until at least there is not a blade or fragment of a stem left to support any grazing animal. The young shoots are eaten off as rapidly as put forth by the plant and the vitality of the plant is sapped, so that it is unable to endure extremes of temperature or shortage or water supply to the same degree as when its growth has been uninterrupted. It has been noted that very often in times of drought the best grazing grasses, such as sedge grasses, needle grasses, gramas, and early mesquite, which will ordinarily withstand the hardest usage, are destroyed root and branch by eaten into the ground. Not only is the grass destroyed, but the ground over extensive areas is trampled and compacted by the cattle until every spring that grows upon it breaks up and is blown away. Following the destruction of the valuable perennials, the low annuals, such as the six weeks' grama, come in and supply almost the only feed. At the same time that the valuable grasses are disappearing the land is being invaded by a vast number of rampant weeds which are not eaten by any grazing animal.
toward the close of this ten-years' shortage of stock there were undoubtedly sections where the native grasses would support 300 head of stock per square mile; and the average carrying capacity of the ranges as a whole was, so far as known, higher than at any time before or since. Newcomers who had not seen the land when it was possessed by the Indian, the buffalo and mustang, at the time when the herbage was eaten down, or kept in check by fires or drought, naturally thought that this rich profusion of vegetation was the normal condition and that the saying that it was impossible to put enough cows on the land to eat all the grass was literally true. The result was a rapid and exhausting over stocking of every available square mile of range land. The best grasses were eaten down to their very roots, the roots were trampled into the earth, and every green thing was cut down so that it could neither ripen seed, and thus perpetuate its kind, nor recover from the trampling and exposure of its roots to the air and sun. The recuperative power of the grasses was lessened or destroyed, and weedy species which were present before, but which had been held in check by the luxuriance of the better, dominant sorts, immediately increased in number by rapid bounds. So also the mesquite bean and the cactus, both of which may be destroyed by fire, grew in numbers and commenced to crowd out the grasses.
Lacking a sound basis for judging grazing capacity he has overstocked the range almost from the start. How else explain the depletion of the range as a whole but by more than half? Climate is the only other possible explanation, and there is more evidence that the western climate has not changed than that it has. Furthermore, there are many specific examples of well-managed ranges on which forage conditions have improved, while adjacent overstocked ranges with identical climate have deteriorated.

After taking into account supplemental feeds and irrigated pastures, which supported 17 percent of the range livestock in 1900 and 38 percent in 1935, the number on range lands reached peaks of approximately 19.9 and 20.7 million animal units in 1900 and 1920, respectively. Since 1920 there has been a declining tendency, with a sharp drop to about 17.3 million animal units in 1935, a reduction of about 17 percent since 1920.

The range portion of the Plains States, the 11 far Western States as a group, and most of them separately, show similar downward trends from different peak years.

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**Figure 7.—EXCESSIVE STOCKING**

Excessive stocking has been one of the prime factors in range depletion, and until about 1920, millions of animal units of surplus stock are removed the range will continue on the downgrade.

The downward trends do not in themselves tell the whole story, because many herds are being carried on a bare maintenance basis by subsisting chiefly on low-value plants. Overgrazing for an extended period destroys the choicest range species first, and the livestock turn progressively to the poorer and poorer plants which, although grazed, are not as nutritious as the original vegetation. Accordingly the full extent of damage to the range often has not been fully reflected in decreased grazing capacity. Overgrazing has left its earmarks in the scarcity of the choicest range plants and the predominance of low-value and worthless plants, in dead or partly dead stumps or stubby branches of shrubs, in noticeable damage to tree reproduction, and in erosion and barren soil. Such earmarks are now conspicuous on several hundred million acres of range lands and particularly on those depleted in excess of 50 percent.

If any other evidence of excessive stocking is required it is necessary only to compare the 17.3 million animal units dependent on the range in 1935 with the estimated grazing capacity of 10.8 million animal units. (See diagram.)

Reduce present stocking by nearly 38 percent to meet the actual grazing capacity. Even humid pastures could not stand up under such abuse; it is far too much to expect of semiarid ranges.

But the evidence of overstocking does not stop here. Average annual death losses on overstocked and overgrazed ranges of as much as 9 percent among sheep and 5 to 7 percent among cattle are practically double the losses under conservative grazing and good feed. Calf crops on overstocked, overgrazed ranges are often only a half or two-thirds of what they are under good conditions. Other specific evidence, historical and otherwise, of overstocking and depletion, could be multiplied almost indefinitely.

As overgrazing is only one, and the most serious, of the defective rule-of-thumb forms of management which have hastened and accentuated depletion. 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, grazing two or more classes on ranges already overstocked with one, have contributed in varying degree and very largely in the aggregate.

When the stockman realized what rule-of-thumb practices were doing to the range, he often was, or thought he was, under the compulsion of other causes which stayed his hand.

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**FROM AN UNSOUND LAND POLICY**

A national land policy unsuited to the semiarid and mountain grazing lands of the West has been still another major cause in the depletion of the range forage. This policy has grown out of such factors as:

1. Belief in universal private ownership of land and the attempt to pass as much land as possible to private ownership regardless of its character.
2. In this attempt, the practically unmodified application to the radically different semiarid West of land laws suited to the humid East and Middle West.
3. The failure to classify land as a basis for alienation according to the economic suitability for private ownership or to its highest form of use.
4. The character of the interpretation and administration of the land laws.

The first alienation to private ownership occurred in the Southwest before American acquisition, as Spanish and Mexican land grants, and amounted to more than 48 million acres. These grants were based on the philosophy of a landed aristocracy rather than that of democratic equality, which was one fundamental basis of American land disposal. Although averaging several thousand acres each, they have not generally resulted in good range management and are depleted almost as badly as the surrounding lands.

Homesteading in the West dates back largely to the homestead law of 1862. More liberal amendments and new laws have included the enlarged homestead law of 1906, the Kinkaid Act of 1904, and finally the stockraising homestead law of 1916.

Neither the maximum of 640 acres available under the stockraising law nor the flat and fertile law could have been designed for such low range lands as found in semiarid West.

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*The Major Range Problems*
justments, the problem which stands out most clearly, as other sections of the report show, is that of restoring uneconomically and destructively cropped lands to range use.

**THE PROBLEM OF UNECONOMICALLY CROPPED LAND**

On a large area of level or gently sloping lands, dry farming has been attempted and has proven uneconomic. The illusion that dry farming had an almost unlimited field for economic application arose from a combination of using virgin soil, enjoying abnormally favorable climatic conditions, and selling in markets that could absorb whatever was offered. The pressure of the World War, which made production through dry farming not alone an opportunity for profit, but a patriotic duty as well, inevitably resulted in breaking with the plow millions of acres which had been the cream of the western range lands. Great areas of the short-grass plains east of the Rockies, in the western Dakotas, in western Nebraska and Kansas, in eastern Montana, in central and western Texas, that once were excellent range, are now unneeded and uneconomic cropland. So, too, are large areas in central Washington, central and eastern Oregon, and in Idaho and Utah. Furthermore, the range values of these lands are gone and can be restored only at some expense and waiting; the crop values are negative.

In addition to these large areas of dry-farmed wheatlands, the problem involves hill farms in the central valley foothills of California, where only the most temporary combination of favorable climatic factors, virgin soil, and market demand could make crop use a success, and where cultivation has resulted in erosion, with depletion of the soil, and damage to watershed and other public values.

Most of this type of land was excellent range, most of it is definitely uneconomic for crops, and most of it can fulfill its true and permanent economic function only if restored to range use. In all such instances, systematic working out of this problem is highly important to the range-livestock industry, not only because the forage-producing capacity of the lands is high, but because it will restore to use many natural range units unencumbered by a patchwork pattern of cropped and fenced rectangles.

**THE AREAS TO CHANGE FROM CROP TO OTHER USE**

The Resettlement Administration has made preliminary estimates of the acreage of land in farms within certain problem areas, much of which should be encouraged to change to noncrop use, and has developed an initial purchase program. The total area of these project farms within the 17 range States is 44,419,000 acres. Of the total, about 3 million acres are in forest belts and should revert to timber production. Of the remaining 42 million acres, about 11 million are croplands and 31 million are range land. Nearly two-thirds of the cropland, or 7.2 million acres, are regarded by the Resettlement Administration as permanently submarginal for crops.

The program of the Resettlement Administration involves purchase of lands of this type, as the most effective means to bring about desirable changes in use. Thus existing public policy contemplates public ownership, at least, as an intermediate step, for such lands.

Outside of these problem areas a large acreage of land has been cropped at one time or another, and while much of it is no longer under cultivation, it is still in private ownership and may be cultivated again. Part of this has already been abandoned because of low productivity. At least 8 million acres of these scattered tracts of croplands are in such condition that public ownership is the logical outcome.

General information developed through the present studies indicates that the area of submarginal croplands of these types which will need to be taken over by public agencies, including both present problems areas and other scattered units, will reach a minimum of 15 million acres.

**THE PROBLEM OF COORDINATING RANGE USE WITH THE NATIONAL AGRICULTURAL-ADJUSTMENT AND LAND-USE PROGRAMS**

The center of gravity of crop agriculture lies in the Middle West. Whatever changes in production are worked out there from a planwise approach to the national crop-adjustment problem, will automatically affect other regions which now produce similar crops. If, as is possible, lands devoted to crops are changed to pasture, with a resulting increase in production of meat animals, the number of meat animals required for estimated consumptive needs will be less from the western range country than in the past or the present. A reduction of this sort might be absorbed by the generally lighter stocking of the ranges that, as this report shows unmistakably, is essential to preserve the range itself. Or it might be absorbed through nonuse of certain range areas; or by increased production of supplemental feeds and a shorter season on the range; or by a combination of lighter stocking, nonuse, and shorter grazing season. The general agricultural crop adjustment plan is not now complete and authoritative enough to justify any final conclusion, but it is necessary to recognize that changes in use of range lands over and above those suggested in this report may well result.

**OTHER USE ADJUSTMENT PROBLEMS**

The report indicates that, on considerable areas, outstanding public values in watershed protection and range for wildlife are deteriorating through overuse by domestic stock. It is possible, and indeed probable, that on part of this land nonuse by domestic livestock may be required, although insuficient detailed work has been done to furnish a final and conclusive answer. In addition, certain privately owned lands are needed for rounding out natural range units in and adjacent to the national forests.

The entire question of the most effective form of ownership to protect public values on range lands of these classes, whether involving nonuse or not, will be examined later in this section. It can best be seen as a whole, rather than through separate study of the parts.
teriorated so greatly during the major droughts of 1893, 1903, 1922, 1928 to 1931, and 1934. All of these factors combine to indicate that at least the drier part of the southern half of this great semi-desert zone may be marginal for permanent ranching. The northern half, where cooler temperatures encourage longer retention of soil moisture, has better forage production and offers better potential permanent range use. Actually the whole area has been badly depleted by continued overgrazing, especially during severe drought.

Dry farming has been attempted on many western range areas, where even ranching is difficult. Misguided settlers tried to grow cultivated crops without irrigation where rainfall is too low for other than range use in parts of every western State. The range was plowed under, cultivated for a few years, and then abandoned. Outstanding examples of such settlement in zones with less than a 15-inch rainfall have occurred in eastern Montana, eastern Colorado, southern New Mexico, and northwestern Utah, within the past decade. The net result has been the financial ruin of the hopeful farmers, and the physical ruin of the range area involved. Best permanent use of the range resources requires a national land-use program that will prevent repetition of such ill-advised exploitation.

The climatic characteristics prevailing on the principal range types, and their effect upon the depletion of such types, are major problems affecting range use, as will be evident later in this report in the classification of types for land use. Where the fluctuations and adversities of climate are not too great to permit range use, probably the outstanding prerequisite of management is the necessity for conservative grazing. Stocking the range at a point sufficiently below average forage production to provide adequate feed for the livestock in all but the most severe drought years is almost axiomatic in management to minimize drought losses, assure stable livestock production, and maintain the range resources. Beyond that, however, much more intensive study and analysis is required for a final solution of the climatic phases bearing on range land use.

Furthermore, although the land that is too dry or otherwise unsuitable for range use may be taken out of production, there still remains the major problem, in the face of climatic risks now known to occur, of developing systems of range management that will enable restoration and maintenance of the forage resources for those areas that remain in use. Years such as 1934 make a dismal picture, but there are always years of plenty that brighten the aspect. The problems are not insurmountable; they are susceptible of solution, as outlined in the program sections of this report.

EXCESSIVE STOCKING

By W. E. Chapline, Chief, Division of Range Research

"The Last of 5,000", that graphic sketch by Charles Russell, world-famous Montana cowboy artist, depicts strikingly the ultimate effect of excessive stocking. One feels that the poor, lone "critter", so utterly emaciated and filled with despair, will soon be a feast for the coyotes lurking in the background. Granville Stuart, in his Forty Years on the Frontier (188), writes:

Charlie was in charge of a herd in the Judith Basin, when the owner, who lived in Helena, wrote and asked how his cattle was getting along. For answer Charlie sent him the sketch.

The important cause, Stuart indicates, was range depletion, brought about by overstocking. He describes how, during the summer of 1888, more than 100,000 head of cattle and innumerable bands of sheep trailed into Montana onto an already crowded range. Then came the first heavy losses from the eating of poisonous plants, in the spring of 1889, because of the shortage of palatable forage. Again that summer, more stock poured into Montana; it was hot and dry, and a severe winter followed. "The cows were all thin" and losses were extremely heavy. Some herds perished outright. Others lost from 75 to 80 percent of their cattle. * * *

In the spring of 1887 the ranges presented a tragic aspect. Along the streams and in the coulees everywhere were strewn the carcasses of dead cattle. Those that were left alive were poor and ragged in appearance, weak, and easily mired in the mudholes.

This may seem an extreme situation, but many like it were recorded in early historical accounts. Bentley (16), for example, in explaining the tendency to expand the cattle business in western Texas, states:

As a result of this madness, the range was overstocked, and a dozen cows and sheep were crowded on the "free grass", where half the number was too many. The ranges were quickly eaten and trampled out. * * *

One cowman decided to sell his herd of 25,000 cattle in 1889:

He did not get his price, hence had to hold over his herd through the winter of 1888-89. It was an exceptionally severe one, and the following spring only about 10,000 head were rounded up * * * On the 100,000 acres he was using he might have held 10,000 head of cattle safely, but in his eagerness to get rich fast he greatly overstocked the range, made no provision for winter feed, never thought it necessary to provide any sort of shelter for his stock, and suffered the inevitable consequences of this reckless way of doing business.

Gordon (65), in a special report on the range area accompanying the Tenth Census in 1880 considered some ranges overstocked and depleted even then. He referred to these conditions in such statements as the following:

The best quality of pasture of today (in Colorado) is only comparatively good, the best quality of 20 years ago having been essentially changed. * * *

The character of the natural grazing in southwest Montana has greatly depreciated. Stockmen of the longest experience reported that a cow ranged 50
acres to find what grew on 20 acres 6 years ago, and on 5 acres in 1876. * * * "Free range" * * * resulted in excessive grazing, and rendered many vast areas of Nevada south of the Humboldt River wholly unfit for more than limited stock occupancy.

Thorburn (144), in describing the early situation in Arizona, stated:

The serious consequences attending the grazing, ultimately, of nearly double the number of stock on the ranges that could be carried safely year after year, culminated in the disastrous drought period of 1893 to 1894. * * * With a general shortage of feed and water on the ranges, stock died off on every hand. It is estimated that over 250,000 cattle, out of somewhat more than 300,000 all told, perished on the ranges in Arizona alone during the period of 1893 to 1894, not to mention the number of sheep and other grazing animals. In many localities from 20 to 50 percent of the stock died from starvation while as many more were left in such condition as to require a season for recovery.

President Theodore Roosevelt's commission to study the land situation and to make recommendations for the best utilization of the remaining public domain, after an exhaustive study including 1,800 answers to a circular letter addressed to stockmen throughout the West, reported in 1905, in effect, that the general lack of control of the range lands had resulted in overgrazing and in the ruin of millions of acres of otherwise valuable grazing territory.

There can be little question but that these writers and the Roosevelt Commission were convinced that during the eighties, nineties, and early 1900's, ranges were excessively stocked and were being depleted as a result.

The range wars of these early days were still another symptom of overstocking. Had range feed been sufficiently abundant to meet the needs of all the livestock that new settlers and stockmen desired to raise, little reason for conflict would have developed. However, when the established stockmen witnessed the invasion of "trespassing" herd and saw their winter's supply of forage, deadly strife resulted.

Has excessive stocking, the grazing of more livestock or other animals on ranges every year than the available range feed can sustain year in and year out, continued on range lands, and has it caused range deterioration? Some stockmen and others are not convinced that it has. The serious and widespread depletion of range lands has already been pointed out. If excessive stocking has been responsible, at least in part, and if present stocking constitutes overstocking, there should be evidence to prove it.

EVIDENCES OF EXCESSIVE STOCKING

Evidences of excessive stocking include such features as:

1. The inability of the range to support the large numbers of livestock carried since about 1890 within the range area, indicated in two ways — by an increasing use of feeds other than range forage, and by a declining trend in numbers of livestock grazing range lands.

2. Deterioration of the range itself, which is not alone due to climate.

3. Present stocking considerably in excess of estimated grazing capacity.

4. Serious losses and other unsatisfactory production as a result of range feed shortage.

Even in the face of severe losses in critical periods, numbers of livestock show a rising trend for the first 48 years. Starvation and winter losses of the eighties were soon forgotten; those stockmen who still had a remnant on which to build and new settlers with capital brought in from the East forced numbers on upward. Livestock were pushed back into the less accessible mountain ranges and into the poorly watered desert areas. The depression, drought, and lack of range feed of the early nineties again took their toll and halted the upward trend for a few years, but another upward surge, principally in sheep, brought a new high peak about 1903.

A still higher peak was reached in 1918, the result of the World War urge for increased production and the encouragement of high prices. The peak was followed by a decline after the war, ending in 1922, when the government took over the cattle business, and the range was placed back on a more rational basis.
In the range portion of the Plains States, numbers on range reached an early peak of over 8.5 million animal units about 1900. After a decline of about 10 percent to 1910 a new peak was established about 1920 when approximately 9.5 million animal units were on these range lands. Since 1920 there has been a decline of about 26 percent, particularly marked in 1934. These figures may not be an entirely true picture of range stocking in the Plains States because of a number of uncertain factors. There are, for example, large quantities of unrecorded grain and other feeds shipped into this area, an unestimated area of grain fields that are grazed in winter and as stubble, and some of the cattle recorded as on farms and ranges on January 1 are shipped out of the area in the spring. The difficulty of taking adequate account of these features in the Plains States tends to show larger numbers of livestock on ranges throughout the year than is probably the case.

In the 11 far-western States the peak of livestock on ranges was reached about 1890, when 12.5 million animal units were obtaining their feed from range lands, 88 percent of the livestock then in these States. By 1910, around 10.4 million animal units were on range, about 90 percent of the total animal units. Following another rise to 1920 there has been a declining trend to 1935 when about 10.5 million, 67 percent of the total animal units, were on range lands. Thus a net decline of about 20 percent has occurred on range lands since 1890.

Figure 53 brings out the decline which occurred in the stocking of range lands between 1890 and 1910, and again between 1920 and 1925. While the grazing of heavier animals, as a result of better breeding and other improved animal production practices, may account in part for these declines, they are also undoubtedly due partly to a declining range-feed supply caused by overstocking.

The rise from 1910 to 1920 represents primarily the increase caused by war demands and does not indicate that there was range forage available for the excess livestock. In fact there are many indications that excessive stocking became the rule. In western Texas, for example, the upward trend was abruptly halted in 1918 and 1919 when range conditions failed, starvation losses were widespread, and forced shipments of livestock were made as ranges became more depleted. Along the Texas & Pacific Railroad in the Trans-Pecos country, ranges presented a pitiful sight. Feed gone, carcasses of cattle in great numbers around water holes, and gaunt, starved animals still alive, their ribs all but protruding through the flesh—all these evidences told a tragic story of failure to keep numbers within safe limits of range-feed production.

The opening up of new areas by water developments, trails, and other means, has also been a factor in holding up numbers on grazing range lands. At first the more readily accessible ranges were stocked. As high prices stimulated expansion or as exhausted feed supplies, especially during drought, compelled removal of livestock from overgrazed ranges, stockmen have drilled wells, constructed reservoirs, and made other improvements in order to further any neglected or lightly used ranges. Such improvements expanded the area available for livestock production in the point of compensating for the overgrazed areas.

Despite rapid stocking of range lands between 1870 and 1890, the declining trends in animal units on range from 1890 to 1910 and 1920 to 1925, indicates at least in part the effect of deforestation caused by overstocking. This decline is substantiated by the increasing use of expensive supplemental feed.

The situation in the 11 far-western States as a whole is duplicated to a degree in most of the individual States. New Mexico, for example, illustrates an even more marked decline in numbers of livestock.
prices and ease of credit. At that time, there were approximately 13,284,000 cattle, 22,457,000 sheep, 3,247,000 horses and mules, and 8,326,000 swine and goats in the 11 far-western States. At the same time, in the range portion of the six Plains States there were approximately 8,032,000 cattle, 1,478,000 sheep, 2,837,000 horses and mules, and 5,276,000 swine and goats. Since the war there has been a declining trend in livestock numbers with an abrupt drop in 1934. The total number of animals within the range area is not an entirely reliable criterion of overstocking since it does not tell the whole story. Numbers which have grazed on the range is the important point. Those who have considered that, because numbers within the range area have held up during the last 35 years, there has been widespread overstocking, have overlooked several important factors. True, animal units on hand January 1, 1935, in the 11 far-western States were only 4.4 percent below the 35-year average; and in the range portion of the 6 Plains States, about 7 percent below; but such calculations fail to take into account the influence of supplemental feed, irrigated pastures, and other factors.

**LIVESTOCK NUMBERS ON RANGE AND OTHER FEED**

In the early days of the West nearly all livestock obtained their feed from range forage. A few ranches put up a small quantity of hay, but this was used primarily for maintaining the saddle horses rather than as supplemental feed for other livestock, except when deep snows or other emergencies required.

When the pressure for range became acute the cattlemen, who were the first to feel it, not only began to practice winter feeding but also to purchase ranch properties on which they could produce hay and other roughages. Later, sheepmen in turn were forced to take similar action (186). The bringing into permanent crop production of about 100 million acres in the West cut into the more desirable range areas but made available large quantities of supplemental feeds and also much stubble for grazing.

In 1890 there was only 34,687,000 acres of improved farm land of all the kinds in the range area, with a little over 3,600,000 acres irrigated; improved pastures were not abundant, and there was relatively little shipment of concentrates into the range country. By 1930 the cultivated area was nearly three times as great as all improved land in farms in 1890; hay and other forage-crop production was nearly five times as great; irrigated land had increased fivefold; improved pastures were common on farms, on millions of acres of wheat and other grain stubble were used for grazing. Several million tons of grain, cottonseed cake, linseed meal, and other concentrates are now produced or shipped into the range area for feeding. Other products used for feeding have also become of vast importance, such as ensilage, beet pulp, pea vines, bean straw, fish meal, and rice and fruit by-products.

While part of this feed has been used to safeguard against losses from inclement weather and because of changed production practices in the livestock industry, much of it has been used because of increasing scarcity and lower value of range forage, manifest in longer winter feeding periods and increased need for supplements at

**EXTENSIVE STOCKING**

Numerous examples might be cited from all sections of the West of longer winter feeding periods because of scarcity of range feed. Cattle are not fed hay and other roughages for 6 to 8 months, whereas in the early days such feeds were seldom required for more than a month or so and that commonly as a supplement to winter grazing.

Similarly, the loss of highly palatable forage plants from the range and the necessity of livestock subsisting on low-value plants has required use of concentrates to furnish the protein and vitamin A (69) so essential to the well-being of the animals. Thousands of tons of cottonseed cake, for example, are fed on southwestern ranges and many carloads of grain and other concentrates are hauled to ranges in other parts of the West to supplement the low-quality range feed now generally available. The use of this supplemental feed, however, has made it possible to carry large numbers of livestock on ranges where they subsist primarily on the low-value plants and thus overgraze the more palatable.

Table 27 presents the approximate number of livestock, expressed in animal units per year grazed on range lands, including unirrigated farm pastures and stubble fields, and the approximate number which obtained feed from harvested crops, concentrates, and other supplements,14 and from irrigated pastures15 from 1930 to 1935. It is believed that the improved, unirrigated farm pastures, grain stubble, and unrecorded concentrates shipped into the range area will offset the 11 percent decline in range area which has occurred, chiefly since 1930.

**Table 27—Animal units dependent on range feed and on supplemental feed and irrigated pastures, in the 11 far-western States and the 6 Plains States, 1930-1935**

<table>
<thead>
<tr>
<th>Region and type of feed</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>11 Far-Western States:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On range land:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other feed 14</td>
<td>4,225</td>
<td>3,914</td>
<td>4,328</td>
<td>3,650</td>
<td>3,306</td>
<td>3,653</td>
</tr>
<tr>
<td>Total</td>
<td>4,225</td>
<td>3,914</td>
<td>4,328</td>
<td>3,650</td>
<td>3,306</td>
<td>3,653</td>
</tr>
<tr>
<td>Ranch portion of 6 Plains States:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On range land:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other feed 14</td>
<td>1,260</td>
<td>1,307</td>
<td>1,256</td>
<td>1,256</td>
<td>1,256</td>
<td>1,256</td>
</tr>
<tr>
<td>Total</td>
<td>1,260</td>
<td>1,307</td>
<td>1,256</td>
<td>1,256</td>
<td>1,256</td>
<td>1,256</td>
</tr>
<tr>
<td>Total range area:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On other feed 14</td>
<td>5,485</td>
<td>5,221</td>
<td>4,847</td>
<td>4,904</td>
<td>4,562</td>
<td>4,909</td>
</tr>
<tr>
<td>Total</td>
<td>5,485</td>
<td>5,221</td>
<td>4,847</td>
<td>4,904</td>
<td>4,562</td>
<td>4,909</td>
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<tr>
<td><strong>Total range area:</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Total range area:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Including improved unirrigated farm pastures.
2 Harvested crops; concentrates, and irrigated pastures.
3 The approximate range which obtained feed from harvested crops and other concentrates was derived for each census year by relating the number of livestock obtaining feed from harvested crops and concentrates in 1930, as worked out by the committees of the U.S. Department of Agriculture (Feed Resources: 11 Western States, Ext. Bull. 84, 1931) and Department of Agriculture, to the census record of hay and forage crop production in 1930, and then dividing the average product by the ratio of hay and forage production as shown by the census in the other census years. The average production of feed was then used in 1944 rather than the crop feed available in 1934. In the table this method is comparable to comparing approximately 2 tons of feed obtained from grass and concentrates against approximately 7 tons of feed obtained from hay and roughages.
depth of footprints in an average mesa region is one-half an inch to 4 inches, the deeper ones being in the lower moister regions, which are best suited to the growth of vegetation. It will be readily seen that a herd of cattle do immense injury to the surface of the ground by traveling over it during a season of rain. Regions which have survived close pasturage are very liable to be destroyed or greatly injured in this way. During the dry seasons the injury from trampling is nearly if not quite as great. Having no turf of leaves and no protection of shallow roots, the surface soil is easily cut and reduced to dust by animals moving over it in search of food and water.

FORMER CONDITIONS.

As an accurate knowledge of the conditions which once prevailed throughout these valleys and foothills was very essential to a proper and intelligent inauguration of range-improvement experiments, it was thought that the best plan would be an effort to restore the condition which once prevailed, for any extended attempts at cultural operations appeared entirely useless. It was thought that the greatest benefit to the range would be derived from rest, accompanied by reseding with native forage plants. Accurate knowledge of previous conditions was therefore very essential. In order to obtain this information a circular letter, accompanied by a series of questions, was prepared by the writer, who was at that time botanist of the Arizona Experiment Station, and distributed to a selected list of correspondents. The letter and questions, reproduced below, are self-explanatory and indicate clearly the purposes of the inquiry. The answers returned agree almost perfectly and point to but one conclusion, namely, that the public ranges of the region were at one time comparatively productive and that their present condition has been brought about by overstocking.

CIRCULAR LETTER AND QUESTIONS.

MY DEAR SIR: The Arizona Experiment Station, in cooperation with the United States Department of Agriculture, is undertaking some experiments with a view of ascertaining the best methods of improving the native ranges of Arizona. Already the Department of the Interior, at the request of the Hon. James Wilson, Secretary of Agriculture, has reserved from entry for our use a tract of land in the vicinity of Tucson, and a suitable portion of this has been fenced. We are, therefore, practically ready to begin operations along lines suggested by the best experience of the officers of this station, as well as of the field agents and officers of the Division of Agrostology, United States Department of Agriculture. It is hoped and expected that this work will result in profit to the ranchers and stockmen of the Territory, and what results in profit to them results in profit to every citizen.

In order to undertake this work intelligently it is necessary to ascertain as accurately as possible the original condition of the range prior to its depletion by overstocking and prior to the excessive droughts of a few years ago, for it is by restoring the range to its original condition that we may hope to receive benefit
Griffiths (1902) Northern Nevada

In July, 1901, Dr. David Griffiths, expert in charge of field management, accompanied by Mr. E. L. Morris, was commissioned to visit northern Nevada and southern Oregon to investigate the range conditions in that section, and the results of his observations are embodied in this bulletin.

The most closely pastured region visited was Steins Mountains. On the whole trip of three days we found no good feed, except in very steep ravines, until we reached the vicinity of Teger Gorge. On a portion of the trip from here to Manns Lake there was a good stand of grass, the side of the gorge and the area immediately to the east being exceptionally fine. There were a good many cattle in the locality, but no sheep had been pastured there this season. In places from Ankle Camp to Nuttersville, a sheep supply camp, there was practically no more feed than on the floor of a corral. We passed two areas at least 2 miles in extent in which even the surface of the ground was reduced to an impalpable powder.

The injury to the open grassy areas from overstocking results mainly from to close cropping, which exposes the bunches of roots to the direct rays of the sun and deprives them of the beneficial action of the accumulation of debris from previous years, both in protection from excessive heat and in holding moisture. On this trip we crossed three areas of this grass, varying in extent from 3 to 60 acres, upon which the beautiful pure growths of sheep fescue were completely ruined. The bunches of great size were completely killed...

Under ruinous pasturing the bunches appear to die usually from the center. One may find in these mountains a narrow green ring fringing a dead center.

Sheep fescue produces an abundance of seed... but whether it will reseed itself readily on the open range when thoroughly killed out over a certain area does not appear clear... One small ruined area visited had the appearance of having been used as a bedding down place about two years ago, and evidently had not been pastured since. Here the old bunches of roots needed nothing more than a kick to remove them from the ground. There appeared to be no evidence that the area was being reseeded, nor that other permanent vegetation was taking the place of this one. It appears from these observations that the process of recuperation when once the grass is killed will be exceedingly slow.

The shrubbery plays a very important part in the forage supply of the mountains also. The extensive areas of cinquefoil (Dasiphora fruiticosa) and Indian currant (Symphoricarpos oreophilus) are invariably defoliated by the sheep. It was difficult to find a twig of the former large enough to make a good herbarium specimen. Really the only shrubs not eaten here appear to be mahogany (Cercocarpus ledifolius) and snowbush (Ceanothus velutinus). Willows are always trimmed up as far as the sheep can reach, and the poplar (Populus tremuloides) is not only browsed, but the young trees are often completely girdled. There are two other plants which might be classed
with those not eaten by sheep, namely, the sages (*Artemisia tridentata*) and *A. arbuscula*, to which should be added the long-leaved sage (*A. cana*), which is abundant in some localities in Steins Mountains. Even the wild chokecherry (*Prunus emarginatus*) is often browsed. The poplar thickets are trimmed up, however, by both cattle and sheep. While the sheep actually eat leaves, twigs, and bark of the young trees, the cattle tramp through the groves a great deal, especially in fly time.

The public ranges of the region are in many places badly depleted, and furnish at the present time not over one-third of the feed which they once did. This is directly traceable to overstocking, and it does not appear clear how matters will improve in this respect in the near future as long as there is no inducement for anyone to do aught but get all he can out of the little that the country does produce.

Clearing the ground of grass is not the only evil effect, as is well known. The destruction of the shrubbery, all too scanty in this region, has a potent influence on the lowland meadows and the mountains themselves, both in relation to the conservation of moisture and the protection of the surface soil from the erosive action of water. The destruction of the vegetation means vastly more than simply depriving cattle of food in the particular locality where close pasturing is practiced.

**Griffith (1903) Northeastern California and Surrounding States**

The present report discusses existing conditions on the ranges of eastern Washington, eastern Oregon, northeastern California, and northwestern Nevada... it would be difficult to find an open range region where water is better distributed than in the Warner Mountains to the east of Jess Valley, These conditions have been taken advantage of to a detrimental extent by the immense flocks of sheep which winter on the deserts to the southward and eastward in Nevada and Oregon. One characteristic feature of those portions of these mountains is the abundance of browse plants, which make them especially attractive to the sheep grower. Sheep need a change of ration in order to thrive to the best advantage, even if that change be to weedy pastures, which are ordinarily considered of little value. Often they appear to be benefited by such a change from a good grass pasture. This testimony of the herder is substantiated by the fact that when grass is abundant the sheep will feed on such bitter plants as the willow, poplar, and some of the so-called sunflowers previously mentioned. In this region such shrubby plants as the gooseberry (*Ribes lacustre, R. luteum, R. cereum*, and *R. aureum*), snowberry (*Symphoricarpus oreophilus*), willow, poplar, mountain ash (*Pyrus sambucifolia*), service berry (*Amelanchier alnifolia*), and *Purshia tridentata* are very abundant. At the time of this visit immense numbers of sheep were practically subsisting on these plants. There really was no grass. Even the banks of the rivulets were chopped up by the incessant tramping, and the steep hillsides, protected by jagged rocks, were dusty. The writer has never seen a more deplorable condition than existed here. The sheep region was visited about the 1st of August, and sheep were supposed to remain there two months longer. It is difficult to imagine what the animals could find to live
on. On an area..., the snowberries had been cropped so that there was nothing left but short, barked stumps and old, woody stems. This is in the vicinity of an old corral, but photographs taken in the same region show that similar conditions exist over a large part of the mountains.

The whole subject of abuses can be summed up under the head of overstocking, but there appear to be two practices which need special attention. At present stock are allowed on high mountain pastures too late in the spring. They should be taken from these pastures as soon as frost begins to disappear, so that the sod will not be injured. Even the carefully handled tame pastures of the East will not stand grazing at this period.

The second abuse of the range... is the "cayuse nuisance." With the decline in the price of horses about 1894 these animals were allowed to run wild, with practically no attention, many herds not even being rounded up and branded. Under these conditions, of course, the horses multiplied and deteriorated rapidly on account of inbreeding, resulting in the overstocking of the ranges with animals which were all but worthless. It was this condition which led the legislature of Nevada, in 1897, to enact a law providing for the destruction of these "unbranded wild" animals. During the past three years thousands of these horses have been shipped out of the country..., thereby relieving the situation very much; but there are still altogether too many of them on the ranges. The quantity of range feed consumed by a good animal is no more than that eaten by one of these almost worthless "cayuses."
The principles outlined, with occasional minor modifications to meet conditions, have been the basis for national forest administration for many years. The chief tasks of the future are:

1. A reduction in stocking averaging 6.5 percent to reach the present grazing capacity of the range (fig. 21). Restoration during the next 50 years should make it possible for these ranges to carry 20 percent more stock than the present grazing capacity of the range.

2. A strengthening of range management; including the preparation and use of intensive management plans on the 40 million acres not now so covered and periodical revision when necessary; seasonal adjustments not satisfactorily solved on about 12 percent of range allotments; reseeding of about 780,000 acres; other special treatment for sore spots; improvements such as water developments and fencing, rodent control, etc.

3. Improvement in the basis for the distribution of the grazing privileges to insure a more effective tie with privately owned lands and to afford greater security to the small private operation dependent on and entitled to use public ranges.

4. Occasional changes for a better correlation of range uses.

Approximately half, or 43 million acres, of the national forest range area is forest land capable of producing commercial timber. On such lands timber production will have to be the dominant use because of the provisions of organic legislation and the general purposes for which the national forests were created. Grazing use will generally be possible but will have to be made contingent upon the protection of forest growth and continuous forest production.

About 22 million acres additional is noncommercial forest in which the correlation required will be between livestock grazing and watershed protection.

Since organic national forest legislation provides for “maintaining favorable conditions of water flow” the handling of livestock grazing must insure watershed protection. On relatively limited areas special erosion-control measures are required.

State authority—of the Grazing Service in the creation of a new grazing service.

In addition to the mandatory technical management into effect the restoration on about many millions of allotments plans into the management program desirable.

The measures capacity of the growth in 50 years. Or necessary to build safely the livestock.

Some provision management of the 211 resolutions and withdrawn with the concurrent.

Definite provisions of Federal lands site for transfer settlement, which should for private ownership.

The primary objectives Indian owned but economic advance.

The major and completed ranges. For stocking averaging (fig. 21), and a s
EXPERIMENTS IN RANGE IMPROVEMENT IN CENTRAL TEXAS.

INTRODUCTION.

In Grazing Problems in the Southwest, and How to Meet Them, prepared by Jared G. Smith, under the direction of the Agrostologist, it is stated that the Secretary of Agriculture, fully appreciating those conditions, directed the Division of Agrostology early in 1897 to begin investigations of the forage problems and conditions throughout the regions of the Southwest with instructions that particular attention be given the native grasses and forage plants, their abundance and value, their preservation, and the possible methods to be employed in restoring the former carrying capacity of the ranges.

In line with these purposes, Mr. Smith visited central Texas in the spring of 1897. Finding there a condition of affairs that, in view of the large area of country included in his proposed field of work, called for a more extensive investigation than he could make in person, the writer was requested to undertake and make the investigations and submit a report upon the grasses and forage plants of central Texas. It was further suggested that the existing condition of the cattle ranges of the Southwest generally be looked into; that the causes of the radical exhaustion of the pasturage of central Texas particularly be determined, as far as practicable, and that a history of such exhaustion, with suggestions for its restoration, be submitted. This special commission having been approved by the Agrostologist, the writer
ment took it in hand it was one of the very poorest." Another remarked: "Don't think that because every stockman in these parts hasn't taken up the methods adopted here they are blind or indifferent. Many of them have been watching and taking notes, and are quietly making experiments on their own places, and I predict that the others will do likewise."

The world is slow to adopt anything new, but once let it be demonstrated that it pays to do so, and no people are more ready to take hold than are the farmers and stockmen of the United States. Hence, it is reasonable to believe that within a few years advanced methods of handling the ranges will be adopted in central Texas and throughout the Southwest generally, and that where one blade of grass now grows in a very few years several will be made to grow. The soil of these ranges is quite as rich in food for grasses and forage plants in 1901 as it was thirty years ago. The seasons are as good, in fact better, in that the rainfall is somewhat greater and is more satisfactorily distributed. Hence the belief that after the proper methods for rejuvenating the ranges shall have been generally adopted, it will not be many years before the range capacity for sustaining live stock will be quite as great as it was in the sixties and seventies, when there was no better stock country to be found than that of central Texas.

HISTORY OF THE FIRST YEAR'S WORK.

SELECTION OF THE LAND.

In March, 1899, Prof. C. C. Georgesou, of the Division of Agrostology, was sent by the Agrostologist to select a section of range land on which it was proposed to undertake and prosecute experiments "to demonstrate the most practicable, and at the same time the most economic, way of treating the natural pastures in order to again cover them with the native grasses or with other species from similar regions in other countries." He put in several days looking over the many sections recommended to him for the purposes in view. Some of them were already fairly good ranges, but he was looking for one that had been run down until it was distinctly a very poor range. Some of them were valley lands altogether, the soils being uniformly rich and specially favorable for the growth, under favorable conditions, of grasses and forage plants, but he was looking for one that was poorer and if anything less favorable for range purposes than the average. He was acting on the idea that if a body of land already stocked with grasses, or one specially located, or specially rich in the matter of its soil, should be selected, no matter how successful might be the results of the experiments to be made, they would not be accepted as demonstrating the correctness of the methods adopted. There would be many who could say, with some reason, and would, in