REPORT

ON

CATTLE, SHEEP, AND SWINE,

SUPPLEMENTARY TO

ENUMERATION OF LIVE STOCK ON FARMS IN 1880.

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SPECIAL AGENT IN CHARGE.

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INTRODUCTION.

This report is supplementary to the regular census enumeration of live-stock, which, under the law, is that of animals on farms.

Cattle, sheep, and swine have been made the special objects of this investigation, primarily on account of their predominant value in furnishing food for man.

While the number of these animals kept on farms (about 36,000,000 cattle, 35,000,000 sheep, and 48,000,000 swine) forms the great mass of those owned in the country, a contribution to the food-supply, by no means insignificant, is made by the animals kept in the dense settlements, but not on farms—the pigs and the cows of the towns and cities. This distribution of food animals, however, is in a sense equable and within the general knowledge of the people; and any person desirous of estimating the number of animals so held may do so for himself with as much assurance as could any other person.

The business of grazing animals as a special occupation, nearly or quite distinct from farming, has been carried on, in the regions derived from Spanish-America, since the establishment of the missions of the Catholic fathers. The ranch or range system, as now seen in the West, was rendered practicable in its enormous and sudden development since the civil war, by the rapidity with which railroads have facilitated communication between the grazing-grounds and the markets. It is but the pioneer of a denser settlement steadily diminishing the open-range grazing by agriculture.

To gain as trustworthy estimates regarding this industry as circumstances admitted, the Superintendent of Census, under authority conferred by Congress, organized an inquiry into the grazing interest in states west of Missouri, taking also the state of Florida, which, from its peculiar character, is subject to similar conditions. The vast region over which it was necessary to make the investigation, the wholly nomadic character of some of the flocks and herds, ranging unrestricted by any tenure of lands, made impracticable an exact count of the animals kept upon these great stock ranges. It is hoped, however, that a reasonable approximation to the more important facts has been attained through the diligent and faithful endeavors of those to whom this work was especially committed. The dividing line between range or ranch cattle and cattle on farms is not always to be drawn with assurance, large herds of cattle sometimes coming within the latter definition for a part of the year or just prior to shipment to eastern markets. It should also be said that the enumerators in many cases returned cattle on the farm schedules which might perhaps more appropriately have been included in this report; but inasmuch as they had been so returned by the enumerators, it was deemed best to let them remain on that schedule.

It will be noted that estimates are included for the cattle, sheep, and swine of the Indian territory, and the unattached public lands not included in the regular census enumerations.

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The field-work of this investigation, begun in August, 1879, was completed in the early part of 1881, under charge of Mr. Clarence Gordon, special agent. Special aid was rendered for a longer or a shorter period by each of the following-named assistants as special agents: Mr. Charles W. Gordon, in southern and western Texas, Colorado, Wyoming, the Missouri river region of Montana, and in California; Mr. J. G. McCoy, over the region between the thirty-third and thirty-seventh parallels and the ninety-ninth and one hundred and eighth meridians, that is, Indian territory, northern Texas, and New Mexico, besides special investigation as to the drives into Kansas; Mr. T. W. Ellison, in eastern and northern Texas; Major T. B. Brooks, in New Mexico; Mr. W. M. Masi, in Wyoming and Montana, from latitude 43° 40′ to the Yellowstone river, and between the 103d and 108th meridians; Mr. James Heard, in Kansas, Nebraska, Wyoming, Colorado, the Yellowstone region of Montana, and Washington; Mr. E. C. Hall, in Wyoming, Nevada, Utah, Oregon, Idaho, and California. The reports on Nevada and on Utah are mainly prepared by Mr. Hall.

Beside the recognition of the indefatigable labor of these stated assistants, the cordial and hearty spirit with which the objects of this commission have been advanced by all classes of citizens in the regions investigated demands the most cordial acknowledgment. Among those who have shown a particular readiness to furnish valuable co-operation in some form may be named the following:

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A special acknowledgment is made of the invaluable services of Wm. H. Brewer, Norton professor of agriculture in the Sheffield Scientific School of Yale College, who was qualified by long investigation, wide experience, and personal knowledge of the western grazing region, to give the report a judicious and intelligent revision in the matter of local peculiarities and capabilities for stock-raising.

The chapter on forage plants, prepared wholly by Professor Brewer, alone appears under his name; but his suggestions have also been largely incorporated where they do not form distinct portions of the report.

GENERAL INTRODUCTORY REMARKS.

Cattle, sheep, and hogs, as well as horses, were first brought to this continent in 1493, by Columbus, on his second voyage, and importations in one way or another have continued ever since.

Beside stock sent over from Europe for settlers, animals were landed from time to time that had been taken on board ship for use during a voyage, and the local modification of breeds has sometimes been considerably influenced by the introduction in this manner of animals of special qualities.

There were two general sources of supply. Spanish America received its early stock from southwestern Europe and the Canary islands, while for the settlements north of Florida animals were brought with emigrants from Great Britain and northern Europe.

Beside such differences as may have existed in the stock in those different portions of Europe from which it was derived, additional variations were developed through new conditions found in America. With the climate and the peculiar conditions of the Spanish settlements, cattle multiplied greatly and often subsisted without any care of man, nominally wild. Sheep also increased greatly with but little attention. In the more severe climate of the north Atlantic colonies, the numbers were smaller than in the Spanish provinces, but there was more stimulus to care in the selection of breeding animals. On the frontier, grazing early became as it were a pioneer industry in advance of the close occupation of the land for agriculture. The cow-pens of the Carolinas, more than a century ago, corresponded, in some degree, to the present corrals of the West. The abundant grazing upon open lands, just in advance of actual cultivation, was along a constantly moving border, that furnished herds to be fattened on farms already brought under the plow, on their way to feed the growing cities of the Atlantic coast. At the time of the Mexican war (1846–'48) this pioneer grazing had crossed the Mississippi river in the corn belt.

Following the Mexican war was a great acquisition of territory, part of it already stocked from Spanish sources. Shortly afterward, the discovery of gold in California stimulated migration across the continent and brought to public knowledge something of the resources of the interior. After the civil war, the completion of a railroad track across the continent made the interior more rapidly accessible and rendered possible a great development of stock-raising, often wholly removed from farming operations.

It seems best for several reasons to treat the western grazing region in two general divisions, although no line of exact limitation can well be drawn. If, however, we take the Rocky mountain divide as a line of division, we shall find stock east of it largely derived originally from northern Europe, and stock west of the line largely derived from Spanish sources; the forage plants of California are quite unlike those of the Kansas plains; the topography of the plateaus and the Pacific slope has its special peculiarities as compared with the eastern slope. On the whole it seems most convenient, therefore, to take the states and territories in the following order: Texas, New Mexico, Indian territory, Kansas, Colorado, Nebraska, Wyoming, Dakota, Montana; then California, Arizona, Nevada, Utah, Oregon, Washington, Idaho, followed by the isolated Florida.

PASTURE AND FORAGE PLANTS.

By William H. Brewer.

The pasturage and forage of the regions considered in this special report are made up of a great number of species growing wild, most of them native or indigenous to the country, though many are foreign species, naturalized from the Old World. Some of the species have a very restricted range; others are almost cosmopolitan. All this might, indeed, be inferred when we reflect on the great area embraced in this investigation and its wonderful variety of physical features. It stretches across the broadest part of the widest mountain system on the globe, and is of vast size, including within its boundaries about one and a half million square miles. Within this area are all the extremes of physical conditions found within our country; the highest and the lowest land, valleys below the level of the sea, and great regions lifted into perpetual snow; soils of every grade of productiveness, from absolute barrenness to the most fertile soils of the country if not of the world; the hottest plains of the continent, with glaciers and perpetual snows on the higher peaks; deserts with no rain and the region of the greatest rainfall of the country; cloudless sky and parching air of some regions in the very strongest contrast with the almost continuous fogs and mists of others.

Such great variety of physical conditions will be accompanied by corresponding variety in the wild vegetation, and the different regions must necessarily be very unlike each other in the elements of their pasturage. Because of this wide difference, both as regards kinds and abundance, the pasturage of the individual states and territories is treated at considerable length in the appropriate place, but some general facts may properly preface the more detailed statements.

The aggregate forage is made up of a great number of species, all growing spontaneously, that is, wild and uncultivated, and distributed in many orders of the vegetable kingdom. While a great portion is furnished by the true grasses and by plants analogous to the clovers of cultivated lands, yet a much larger proportion consists of other kinds of herbage than exist in the pasturage of more agricultural regions.

The whole aspect of the vegetation of the western region is unlike that of the agricultural regions east of the Mississippi. Over most of that portion of the country specially discussed in this report (Florida excepted) woody vegetation is much more restricted in its range than in the country east of the Mississippi, and natural woodlands and forests occur only as a narrow fringe along the streams and on the slopes of the higher hills and mountains. Vast portions are treeless or nearly so. The treeless portions are not usually covered with such tall grassy vegetation as marked the original prairies of Illinois and Iowa, and the forests and woodlands where they occur are entirely unlike those of the Atlantic states, both in their general aspects and in the species which compose them. They are almost entirely of needle-leaved trees (*Coniferæ*), broad-leaved trees being found in conspicuous abundance only in the fringes along the streams or scattered on the slopes, sometimes forming copses or "openings", but very rarely indeed forming a forest even of limited extent. Over vast areas they are only scattered at rather rare intervals and form no conspicuous element in the tree growth. The principal exceptions are the "openings" and "cross-timbers" of Texas and Indian Territory, and portions of the coast-range valleys of California and Oregon. The treeless portions may be either desert, without conspicuous vegetation (but this is indeed rare), or prairies covered with a sod, or with an annual herbage rather than a sod, or more or less covered with low shrubs. When these latter form a thick growth, it is called a "chaparral" or "chamisal", according to the locality and the species which compose it. The mountain forests are entirely of needle-leaved trees (*Coniferæ*), usually more open and with less shrubby undergrowth than the forests of the Atlantic slope have, and this modifies and affects the mountain pastures in several ways.

The natural pasturage plant may be roughly classified into three great classes, the grasses proper, herbage other than grass, and shrubby vegetation or "browse". The grasses, of course, furnish the staple everywhere, in some places practically all pasturage, and assume various characters in the different regions discussed.

On the treeless plains and plateaus east of the Rocky mountains, and on the high plateaus in the interior of the great mountain system, the grasses form a sod or turf of different degrees of firmness and consistency, according to

the soil and the climate. The tall species of the original prairies of Illinois and Iowa diminish westward as the land becomes higher and the climate drier and the grasses become shorter; but some of the species are exceedingly nutritious.

A number of species belonging to several genera, known rather loosely under the general names of "grama grass", "buffalo grass," and "mesquite grass," are especially noted for their nutritious qualities. The term *mesquite* (called also *muskit*) and *grama* are confined to the southern tier, but "buffalo grass" is a common term from Texas and New Mexico to British America. Some of the species to which it is applied will be noted in our list. The species are short, the stems rather hard, and they dry up on the ground, retaining their nutritive qualities when thus dried, as the more succulent cultivated grasses of the agricultural regions do not.

Many of the perennial species, particularly those of the hills and the mountains, instead of forming a sod or turf, grow in tufts or bunches, and are known under the general name of "bunch grasses". Under the conditions of climate which pertain to very much of this region, sod where formed is in its character quite unlike the turf of the cooler parts of Europe and of the agricultural states of the Union, and the same species which form turf there, in this region show a greater tendency to grow in tufts or bunches. So marked is this that several of the meadow grasses of other regions are returned as "bunch" grasses in the appended list. Some of the bunch grasses are eminently nutritious, others less so, while still others are only eaten by hungry animals when other forage fails. The term "bunch grass" conveys no idea of kind, species, genus, or value, but merely a habit of growth.

The true grama grasses belong mostly to the genus *Bouteloua*, and the true buffalo grass to the genus *Buchloë*, but how loosely these terms are used will be seen in the list of grasses appended. Some ranchmen make the distinction that the buffalo grasses increase by stolons or creepers, while the grama does not; but as a whole the terms are so loosely used as to be of little value in any popular description of the pasturage of the country further than to indicate that the grasses referred to grow on dry soils, that they are nutritious, and that they retain their good qualities when dried standing.

The total number of species of grass found in the region under consideration is very large, and cattle probably eat nearly all the kinds. California is the only state of this region whose botany has been elaborated and published, and in that state about 180 species of grass have been described, belonging to 62 genera. Beside these, there are many species belonging to the natural orders *Cyperaceæ* or sedges and *Juncaceæ* or rushes that are popularly known as grasses. Excluding all the grasses and grass-like plants that are rare, and the few not liked by cattle, it is probable that more than a hundred species, if not indeed a hundred and fifty species of plants, form an appreciable element of the pasturage of the region under consideration. Numerous circulars and letters have been sent out to gain information on this point, the general results of which are given in the appended list.

In the list the popular names are given as sent in, although often these are not the ones by which the species are best known. This has seemed best, because they were the terms used by the ranchmen themselves to indicate what their cattle fed upon. The following alphabetical list will give a general idea of the more important grasses, although doubtless many species are omitted which somewhere are of considerable importance. The list embraces the true grasses and some of the other forage plants. Many of the specimens which were sent to the Census Office were undeterminable; the list of western forage grasses must therefore remain incomplete until the region is more thoroughly studied botanically.

Agrostis, bent-grass. A dozen or more species of this genus are found in the western United States, native or naturalized, and all are eaten by stock. *A. vulgaris*, the common red-top of the Atlantic states and Europe, spreads through the cooler regions as fast as cattle and sheep come in. *A. Muhlenbergii* is returned from Texas as bottom-mesquite grass.

Aira Mexicana, Texas, is one of the so-called mesquite grasses. Several of the species of this genus which are common east are more or less abundant west. *A. cæspitosa*, hair-grass, is returned from the cooler regions; it ranges from Oregon to the Atlantic states. It is an Old-World species which is spreading in the mountains.

Andropogon scoparius is reported from various places east of the Rocky mountains (it ranges to the Atlantic); in Texas it is spoken of as "a great fat-producer"; in portions of Kansas, as forming 20 per cent. of the forage. It is returned as sage-grass, broom-grass, and even under other names, and once (from Texas) as "white mesquite". *A. furcatus*, a common and valuable prairie grass, best known as blue-stem and blue-joint, also has a wide range from the plains eastward, constituting 40 per cent. of the pasturage of portions of Kansas and other prairie regions. *A. Torreyanii* is returned from Texas under the names of blue-joint and white grama, and described by some ranchmen as "an unequaled fat-producer".

Aristida purpurascens, prairie mesquite, from Texas and Indian Territory. It ranges northward to Illinois.

Atropis tenuifolia is one of the most valuable bunch grasses, ranging from San Diego to Oregon, and eastward to Colorado.

Avena fatura, the wild oats of California, is very common in that state, and is noticed more fully below.

Bouteloua oligostachya is the true grama grass, and is the species specially known as such in the localities where it abounds, probably from Texas to Arizona and Colorado. But it is also called in the returns mesquite-grass, muskit-grass, bunch-grass, buffalo-grass, etc. The term "grama" is little used north of Colorado, but this species ranges from Texas westward to southern California and northward to Wisconsin and Montana. *B. hirsuta*, known by the same names, and often also as black grama, ranges from Texas to Wisconsin and Illinois, on the

north and east, but does not reach California on the west. *B. curtipendula* ranges still further east, even to southern New York, but is apparently nowhere so common or so valuable as *B. hirsuta*. *B. polystachya* and *B. aristoides* occur along the southern tier upon the Rio Grande to the Colorado river, and thence into Mexico, but do not extend far north. They are common in some localities.

Buchloe dactyloides is the celebrated buffalo-grass, and is known to hunters, herdsmen, and plainsmen as one of the most nutritious of grasses. It is short, the foliage curly, it increases by stolons (runners) as well as by seed and by root. In Texas it is sometimes known as vining mesquite. It belongs to the dry and elevated plains from the Rocky mountains eastward to Kansas, and from British America to Mexico.

Calamagrostis canadensis, under a variety of names, blue-joint, bunch-grass, etc., ranges in the mountains from California to the Atlantic and from Mexico to British America, a valuable forage where found, and is often abundant enough for hay. *C. longifolia* has also a wide range from Texas to Michigan under various names. From Texas it is returned as mesquite and grama grass, illustrating how confused those terms are with many ranchmen.

Distichlis maritima is the most common "salt grass" from California to Carolina, and is found on saline alkaline soils throughout the interior southward to Mexico.

Elymus.—Various species of this genus occur in the region, commonly under the popular name of wild rye; all of them are tall and coarse and are eaten by cattle, although some have little value after they have dried standing. The most common species reported by stockmen and botanists are the following: *E. arenarius*, in northern California and northward, where it is called rancheria-grass; its seeds are gathered by the Digger Indians for food; it ranges to Asia and northern Europe, but not to the eastern states; and *E. canadensis*, which ranges from Oregon to New England and to New Mexico. *E. condensatus* is the most common wild rye of the interior. It belongs strictly to the western United States, and ranges from Colorado to Washington territory and southern California It is also called reed-grass, bunch-grass, etc. *E. Sibiricus* is another species from the Old World, which now ranges from California northward to British America and eastward to lake Superior.

Eriogoneæ cuspidata is one of the valuable bunch grasses. It ranges from British America to Mexico and from California to the Rocky mountains. It runs into several varieties, one of which is called in southern California *saccatoo* or *saccatoa*. *E. Webberii*, a smaller species, about 6 inches high, also a bunch-grass, occurs on the Sierra Nevada.

Eragrostis poæoides, a species naturalized from the Old World, and now found scattered throughout the United States, is returned from Texas as one of the buffalo-grasses of the stockmen; and *E. oxylepis*, also in sandy soils, from Texas, as red-top grama. The genus *Eragrostis* is a large one; there are numerous species eaten by stock.

Festuca is another large genus, containing some of the most valuable of pasture grasses, and is abundantly represented in the forage of the western regions both by native and by naturalized species from the Old World, which follow the cattle and sheep and come in where they range. *F. ovina*, sheep fescue, is common in the cooler parts, from California and Montana to the Atlantic. It is one of the most valued of sheep grasses, and has followed sheep from Europe to the remote parts of the earth, even to New Zealand, Australia, and Tasmania. It varies in habit of growth, and comes to us from cattlemen under numerous names, "bunch-grass," "red-top," "sheep-grass," etc. Among the native species are *F. occidentalis*, a valuable bunch-grass from Oregon, and *F. scabrella*, another, which ranges from California to the Rocky mountains.

Hilaria rigida is a hard grass occurring in northern California on the semi-deserts of San Bernardino county It is valuable for feed, is said in places to constitute three-fourths of the pasturage, and is known as *gallote*, *gallota*, or *galletta*. I suspect that the gietta-grass of Arizona consists in part of this species and its near relative, *H. cenchroides*, which occurs in that state, and increases by stolons or creepers rooting at the joints. It agrees with some of the descriptions by ranchmen, but specimens have not been received to determine accurately what gietta-grass really is.

Hordeum murinum, naturalized from the Old World, has become a great pest in California, where it is known as squirrel-grass, fox-tail, and white-oats. It is known in the Old World as wall-barley, and way-bent. While green and growing it has some value as feed, but not much. It is annual, and comes in where the pastures are overstocked, particularly on the lower hills and valleys of the coast ranges. When the heads ripen, they break up, and the barbed seeds and awns work their way into every crevice; they insert themselves into wool, and bore their way sometimes into the flesh of sheep and lambs; they get into the eyes of domestic animals, often destroying the sight; they get into the throats of horses and mules and cause inflammation; and, taken all in all, this weed is probably the most troublesome of California, in some few places killing many lambs and doing other damage. It has spread to the Cape of Good Hope, Australia, Tasmania, etc.

Kœleria cristata is a bunch-grass common in California, and becoming more abundant as the regions become settled and occupied, for it is an immigrant from the Old World, and is now found from Pennsylvania to the Pacific.

Melica.—Eight species are known in California (but one in the eastern states). Some are very abundant and range widely throughout the region. They are mostly bunch grasses, and belong largely to the mountains. *M. imperfecta* and *M. stricta* are the most abundant, and range far beyond the borders of that state.

Muhlenbergia gracillina is a common grass on the plateaus from Colorado to Texas, and is one of the species returned as buffalo-grass, being a small, nutritious species. About half a dozen species of this genus occur in the western United States, and here and there constitute a valuable element in the pasturage.

Munroa squarrosa is another of the low, nutritious buffalo grasses, and originally covered tracts of thousands of acres together of the upper plains region. It ranges from British America to Texas, but is a more noticeable element of the vegetation north of Colorado than south of it. As it is a prominent *buffalo* grass of the north, so it is one of the *grama* grasses of Texas.

Panicum, a vast genus which numbers throughout the world several hundred species, is not so richly represented in the western United States as in the eastern, but nearly a dozen species are known, native or introduced. *P. capillare*, the Old-Witch grass, is distributed throughout the country from the Atlantic to the Pacific. *P. sanguinale*, the crab-grass and finger-grass, comes in with settlements, and is as widely scattered. *P. agrostoides*, the most abundant species of the Atlantic states, is common through the west in moist valleys. *P. obtusum* is returned as wire-grass. *P. crus-galli* follows the settlements, and is found about the barn-yards and corrals, and various other species in greater or less abundance have been noted by botanists in the region, which have not come in among the returns of the stockmen.

Phalaris canariensis, of the Old World, which furnishes the canary-seed of commerce, and is cultivated in California, often becomes naturalized, and although not abundant, it attracts attention because it is conspicuous, and is returned under many fanciful names, wild-goose grass, wild wheat, wild canary, etc. *P. arundinacea*, a variety of which is the familiar ribbon-grass of gardens, sometimes becomes wild near houses, loses its striped character, and thus takes other names. *P. intermedia*, which ranges from Mexico to Oregon and the Atlantic, is known to California farmers as California timothy, but is of comparatively little value.

Phleum pratense, from the Old World, the timothy and herd-grass of the Atlantic states, becomes naturalized wherever the soil and climate permit; it is often sown and is already common through the mountains to the Pacific coast, and is valuable wherever found.

Poa, another large genus, is abundantly represented in western North America both by native and naturalized species. *P. annua*, a small annual species widely diffused throughout the world, springs up quickly after the rains, makes the ground look green, but is of little value. *P. compressa*, also from Europe, is a common *wire-grass*. *P. pratensis* is the famous Kentucky blue-grass, and follows cultivation; it is common in California, and is becoming common throughout the Rocky mountains. *P. serotina*, false red-top, is found in Oregon and the Rocky mountains; eastward to the Atlantic it is common where the soil is moist. Other species, common to both the New and the Old World, might be named. *P. alpina* is found in the Sierra Nevada and the Rocky mountains up to near perpetual snow (as it is in the mountains of the Old World), and *P. tenuifolia* is one of the valuable native bunch grasses of the western mountains.

Sorghum nutans, a tall species two to five feet high, is common westward to the Rocky mountains, and is popularly known as broom-grass, wood-grass, and Indian grass. In portions of Kansas it constitutes 20 per cent. of the forage.

Sporobolus heterolepis is abundant from western Kansas eastward, ranging to New England on dry soils. In places it forms an important element in the prairie pasture.

Stipa occidentalis is a common bunch-grass in the Sierra Nevada. *S. comata* ranges from California to the Rocky mountains, and from Montana, where it is common, to New Mexico.

Triticum repens, the common couch-grass and quitch-grass of the Atlantic states and Europe, is found probably in every state and territory. In Oregon and Montana it is called bunch-grass; in Texas it is known as cañon-grass, wild-rye, etc.; from Indian territory as sour-grass, and so on. It is not a valuable forage, but is eaten willingly by cattle. *T. caninum*, another European species, is found scattered from the Atlantic to the Pacific; it has but little value, but is one of the bunch grasses of Oregon. *T. strigosum*, also called bunch-grass, is more abundant, and is found from California and Oregon to Colorado. It does not occur in the Atlantic states, but occurs in Asia Minor and other parts of the Old World.

Tripsacum dactyloides is the gama-grass (not grama) of the South. It is a late, coarse grass, three to seven feet high, with leaves like those of Indian corn, and grows on moist soils from Texas to Illinois, and eastward to Connecticut.

Uniola latifolia is returned from Indian territory under the names of oat-grass and wild-oats. It ranges to Illinois and Virginia, on shaded hillsides.

Over all this region a very considerable proportion of forage is furnished by herbaceous plants other than grasses. There are probably some hundreds of native species that contribute somewhat to this, some of them but little, but others very much. They belong to many natural orders, and no attempt has been made to enumerate them. Prominent among them are the native indigenous clovers. But five species of clover (*Trifolium*) are native to the agricultural states east of the Mississippi river, while some forty species occur from the Rocky mountains westward. Twenty-five of them are found in California alone. Some of these form an important element in the natural forage, others are too small or too rare to be of much value, but only one (*T. Andersonii*) is not eaten with avidity by stock. There are many other species of this same natural order (*Leguminosæ*), wild vetches, wild lupines, etc., eaten by stock. Plants other than the true grasses furnish a larger portion of the forage of those regions which have rainless summers, some of which (alfileria, bur-clover, etc.) will be again mentioned. The native annual species, however, is liable to be easily run out by heavy stocking. Of the cultivated species tried to supply the

place of such, alfalfa (the Chilian variety of lucerne) is the most valuable, as indeed it is the most valuable cultivated forage plant of hot and dry climates in other parts of the world.

The third great class of natural forage is furnished by shrubs, "browse feed," as it is called. Of the undergrowth of the forest nothing need be here said. In this region, as elsewhere, if cattle and sheep range in forest and woodlands they eat the twigs and foliage of various woody plants. But over many of the drier sections of the interior various shrubs form a notable feed in the winter. Prominent among these is the celebrated "white sage", or, as it is sometimes called, "winter fat" (*Eurotia lanata*), which ranges from the Saskatchawan to New Mexico, and from the Sierra Nevada to the Rocky mountains. After frosts come its quality is improved (as is true of other shrubs of the same order, *Chenopodiaceæ*), and it is a valuable winter forage in many places in the Great Basin. Other species are here and there called white sage, but this is the one *par excellence.*

The name "greasewood" is applied to a considerable number of plants. The most common ones, however, are the *Sarcobatus vermiculatus* and *Abione canescens*, both more or less thorny shrubs and looking most unpromising as forage, but which nevertheless have considerable value. *Purshia tridentata* is also widely known as greasewood, and is eaten by stock, and so are a number of other species less common and of less value.

The mesquite (*Prosopis juliflora*) grows as a shrub or small tree on the dry slopes and mesas from Texas to California, and produces a crop of sweetish pods four, six or more inches long, and each containing numerous bean-like seeds. Both the pods and the seeds are eagerly eaten by stock, and are very nutritious. The plant is a near relative to the carob bean of the Mediterranean region, which is an important forage in Spain, Syria, and northern Africa.

"Sage" is a name given by the early mountaineers to the shrubby species of *Artemisia* found so abundantly from the plains to the Pacific. There are many species of this genus, bitter, strong smelling, and belonging to dry regions. But the name has come to have a wider use among stockmen, and besides the white sage we have yellow sage, red sage, black sage, rabbit sage, etc., applied to various species of shrubs, some of which are eaten by stock in extremity, others more willingly, but taken as a whole there is not much dependence upon browse feed, except with the white sage, although in many places it forms an element not to be entirely ignored.

When new and natural pastures become occupied with cattle or sheep a condition new to the region is introduced, the old balance established by nature is disturbed, and immediately a change begins in the pasturage, as to both kind and quantity. In all such cases some of the species rapidly diminish, and may become entirely extinct, as has happened in many parts of the world, notably in St. Helena and other islands. Other species diminish without actually perishing from the face of the earth. So soon as such a region becomes overstocked, then the aggregate forage rapidly decreases, but nature in time supplies the place with other species. The nature of the change is determined by the species which composed the original pastures, the climate of the place, and the kind of animals pastured. Where a very considerable portion of the forage is of annual plants, as is notably the case in California, if the growing plant is eaten off before the seed ripens, or if the seeds themselves are palatable and are eaten, then the natural seeding is prevented and the pasture rapidly diminishes; then new species come in, which are either less palatable to stock or have some natural provision by which the seed is protected and self-planted. We have specially good illustrations of this in California, particularly in the valleys and lower ranges west of the Sierra Nevada. Originally the winter and spring herbage of this region was especially rich in variety and abundant in quantity; the country was alike the delight of the botanist and the paradise of cattle. With settlement and herds the native herbage decreased and European species came in their place. Wild oats (*Avena fatua*) first came in. This species, originally from the Mediterranean region, naturalized on the Pacific coast of both North and South America, came into the state from the south with the Franciscan fathers and their herds, and spread northward. It was most abundant between 1845 and 1855, when hundreds of thousands of acres were clothed with it as thick as a meadow. Alfileria, or pin-clover (*Erodium cicutarium*), apparently came before it, some botanists believing it to be native, as Nuttall found it far in the interior in 1836, but it did not increase so rapidly as wild oats, and never had such possession of the soil anywhere; but it increased until perhaps 1865 or 1870. This, too, is a native of southern Europe, as well as bur-clover (*Medicago denticulata*), which came in later and slower, spreading with sheep along the lines of their drives, and along the lines of wagon roads across the great central valley. All these are annual species, all are valuable for forage, but each has a provision for the protection or planting of the seed. Both wild oats and pin clover have hygrometric beards, which twist and untwist with changes in moisture in the air; the seeds crawl as if alive, and creep into the cracks in the dried soil in summer, where they are safe from harm and self-planted. When the rains come one often finds the ground traced with a network of green lines, which show where the soil formed cracks the previous summer, into which these seeds had crawled and planted themselves. With bur-clover the protection is of another kind, and the species has spread to Texas, Australia, cape of Good Hope, South America, and to all dry countries where sheep are fed.

When the overstocking is too severe for these, then another species comes in, the pernicious "squirrel-grass" or fox-tail (*Hordeum murinum*). This is less relished by stock, and its heads when ripe break up, the sharply-pointed and barbed seeds and awns doing much damage to stock; they are saved from destruction and are scattered by their very harmful character, and plant themselves much as wild oats do. So, partly because of its worthlessness when green, partly because it is an enemy to stock when ripe, and partly because of its means for dissemination and self-planting, this pernicious species can hold its own where better kinds are exterminated.

With protection and care valuable species are encouraged and the pastures of an old region may, and often do, become more productive than when new, as is so notably the case in all agricultural regions; but what is to be the condition for the next few years of these regions now or recently overstocked, and where the climate is dry and the original vegetation sparse in quantity compared with moister regions, no one can as yet say. What species are to take the place of those being reduced or exterminated by overstocking only the future can determine.

Every wild pasture has its own pernicious plants, and our western country has its own share of evil species. It has burs to infest wool, but some of the naturalized foreign species are worse than the indigenous ones.

There are also a few poisonous weeds. The names wild carrot and wild parsnip are applied to native species of *Umbelliferæ* which are hurtful just as they are in other parts of the world, but what the particular western species are that occasionally poison stock is unknown. Here as elsewhere there are also some hurtful species belonging to the *Ranunculaceæ*, but what they are is unknown. In the northern regions from Oregon to Montana stockmen speak occasionally of "larkspur" as poisoning stock. There are many native species of larkspur (*Delphinium*) belonging to western America, some of them of great beauty, and are found in the gardens of Europe and the eastern states, but which of them (if any) is chargeable for this poisoning is unknown. It is possibly a native monk's-hood (*Aconitum Fischeri*) which is occasionally found in this region, but is nowhere an abundant plant.

Farther south, from Colorado to Texas and California, there are a few species, known as *Loco*, which are harmful. They belong to the genus *Astragalus*, a genus represented by very many species in the west, only a very few of which are known to be hurtful. Of the noxious ones, some are reputed to injure stock by producing severe constipation, others produce a sort of insanity or intoxication, and rarely they produce death. There is much discrepancy of statement as to which species is harmful, or how harmful, but that some are harmful there seems to be no question. *Astragalus mollissimus* from Texas and *A. Hornii*, from California to Utah, are species of evil repute. But as a whole, the wild pastures of the west are unusually free from harmful species.

TEXAS.

HISTORICAL.

The following dates in Texas history are given as a guide by which to compare the growth of the stock business:

1685. This year witnessed the beginning of a small French colony under the Chevalier La Salle, who landed on the shores of Matagorda bay. This occupation was brief.

1689. A temporary colony of Spaniards settled on the spot where La Salle had previously located.

1700. During the decade before and that after this date, the Spanish Roman Catholics built numerous missions in Texas. The strife between the authority of Spain and that of Mexico, involving the Indian tribes, induced, finally, a savage warfare, resulting, after many massacres, in the Spanish abandonment of their possessions in Texas.

1821. Mexico threw off the Spanish yoke, and Texas became a tributary of Mexico. At the same date Austin planted his colony in Texas. The independence of Texas was practically secured in 1836; it was acknowledged by our Congress to be an independent republic in 1839, and was annexed to the United States in 1845. The next year the Mexican war occurred.

Before 1775, after the founding of the town of Laredo, which was the only permanent settlement of the Spaniards on the lower Rio Grande, ranches and haciendas had extended over the country between the Nueces and the Rio Grande, and at the beginning of this century extensive herds of cattle, sheep, and horses grazed on the luxuriant pasture between those rivers. Later, when the Spaniards were driven from their Texas settlements, and during the border warfare of the Texas revolution (1830–1836), when the inhabitants of that region were destroyed or dispersed, the cattle and other stock running wild increased greatly. From the planting of Austin's colony, almost all of the incoming settlers of Texas brought live stock with them. Some French cattle came in from Louisiana, while so-called American "natives" entered with the emigrants from various states. In 1830 there are said to have been 100,000 cattle in Texas, of which Spanish cattle occupied about four-fifths of the extent of the settled portion of the state, and cattle from the United States stocked about one-fifth of it.

In 1837 and 1838, the "cowboys" gathered herds of from three hundred to a thousand head of the wild unbranded cattle of the Nueces and Rio Grande country, and drove them for sale to cities of the interior. In 1842 the driving of cattle to New Orleans began. The first shipment from Texas was by a Morgan steamer in 1848, but up to 1849 there were very few outlets for the stock, which had increased enormously since 1830. There is a report of a drive of 1,500 to Missouri in 1842, but the earliest perfectly authenticated record of a business venture of that kind found was for 1846, when Edward Piper, now of Decatur, Illinois, drove 1,000 head of Texas cattle to Ohio, where he fed and sold them. From 1846 to 1861 the drives increased. In 1850 drives began to California. The first drive to Chicago was in 1856. From the beginning of the northern drives in 1846 until the war of the rebellion there was always some movement of cattle out of Texas, but it was irregular. A large proportion of the cattle driven was sold on the plains. Some cattle went into California, Arizona, and New Mexico. Beside such drives there were were only the shipments from the seaboard cities to New Orleans and Cuba.

When the Texan republic was formed, all unbranded cattle found at large were declared public property. Then, and for years afterward, cattle or sheep were worth but little. The Indians stole them, the Mexicans raided them and drove them across the Rio Grande, and the Texans "mavericked" (*a*) the unbranded. The demand, though limited, with the small expenditures necessary, made the beginning of the business easy. A wealthy stock-owner stated that when he settled in Live Oak county in 1849 the region was overrun by herds of wild unbranded animals, and that upon the prairies he had often come upon old branding-irons, unrecognized by the people living there. Up to the time of our civil war the possession of cattle was precarious; there was a great supply, less valuable per head each year, demands at home or abroad were small, being limited to certain drives, and to shipments by sea for Mobile and New Orleans which were taken by the Morgan Steamship Company.

The returns for assessment of the live-stock of Texas in 1860 showed 3,535,768 cattle, 753,363 sheep, and 1,371,532 hogs. If those returns were in the same proportion to the actual number as the returns for 1880, we may calculate that there were really 4,785,400 cattle, 1,187,600 sheep, and 2,509,000 hogs in 1860. During the civil war, from 1861 to 1865, with no outlet eastward except a limited one toward the southwestern confederate states, and

a Unbranded neat cattle over a year old, in the language of Texas ranchmen, are called "mavericks", and are branded by the one who first has opportunity.

with but slight business with California, live-stock greatly increased in numbers; but they were neglected, old cattle accumulated, and a large percentage of the calves for four years escaped branding or received other brands than those of their rightful owners.

Agencies, however, established within the state for mutual protection, apportioned their administration to cover many districts, each furnishing its quota of executive assistants who rounded up, branded, etc., while an account was kept for the interests of absent parties. The system worked well, and preserved the cattle business from chaos. While cattle in Texas could then be bought at an average of $3 to $4 per head, the same stock would have brought $30 or $40 in the northern states; and mature beeves which cost in Texas but $5 each by the herd were worth $50 each in other sections of the United States.

Sheep did not increase proportionately with cattle; the shepherd's staff was turned into a sword, and his stock suffered from neglect; scab and other diseases prevailed; exposed to the ravages of storms, thieves, and wild animals, they degenerated and decreased rapidly. Such was the condition until 1865, when began the cattle traffic as part of the regular supplies of the other states.

The total number of cattle taken from Texas by northern drives alone since 1865 is 4,223,500, or an average annual drive of 281,566. To these there must be added from 70,000 to 100,000 driven to California and from 100,000 to 125,000 to New Mexico and Arizona. Beside many taken out by Cortinas and other Mexican raiders, a large number were driven north spasmodically and without reliable record from 1846 to 1866. All going out by trail we may safely estimate to make a grand total of 5,000,000 cattle previous to 1881.

By sea we find the exports up to 1859 and for 1866, as estimated, were 1,383 head; returns from customs districts since 1859, 246,617; total, 248,000.

We have been unable to obtain the figures of the number of cattle transported beyond the state by each railroad since its construction.

From the above statements we may approximate the total number of cattle that Texas has sent beyond her borders since she became a part of the United States, that is, practically since the beginning of her stock business, as follows:

By railroad, schedule returns, 1880	78,000
By railroad, previous years, estimated	150,000
By northern drives, 1866–1880 (*a*)	4,223,500
By drives previous to 1866, estimated	876,500
By sea, returns of customs districts since 1859	246,617
By sea, estimated for certain years (*b*)	1,383
Total	5,576,000

At the close of the war the cattle supply in the north was greatly reduced, while in Texas the supply was large and prices were very low. These facts induced a drive in 1866 of about 260,000, with Sedalia, Missouri, as the objective point.

Notwithstanding the wide margin between the purchasing price in Texas and the selling price in the northern markets the business was generally disastrous to those who invested in it because of the armed resistance of organized bodies of men in southern Kansas and Missouri who forbade the drovers to cross those states. This sometimes resulted, when the Texas men persevered in their aim, even in the killing of some drovers, or in the stampeding and stealing of their herds, or in subjection to a heavy tax for safe transit; other drovers were forced to turn off the direct track and make a long detour south of the hostile borders until west of all settlements, and then push north to find a safe way to Saint Joseph and to Chicago; or, driving into Iowa, they sold to feeders. The opposition to the drives was for two ostensible reasons: fear of Texas cattle-fever, and the preservation of the pastures of the invaded states for their own use; but it gave an opportunity for lawless men of the border to steal in the confusion produced. The drovers who made terms with the enemy did so at the cost of the profits hoped for at the end of their journey. Those who sought out a new trail to market were so delayed that the latter part of the drive was made in cold weather on poor grasses, with thin and exhausted cattle.

The fear of "Texas fever" has been mentioned as one cause of the hostility in southern Kansas and Missouri to the passage of cattle northward. Though there was no general alarm in the western states concerning "splenic fever" until the outbreak of 1868, when government ordered an investigation, yet there is abundant proof that the movement of *coast* cattle, whether Texas or Cherokee, or those of Florida and lower Georgia, had often been attended by the introduction of fatal disease to the cattle of the higher inland regions, and in 1866 and 1867 Mr. J. R. Dodge, of the department of agriculture, instituted a systematic series of inquiries regarding it.

In 1867 we find the annual drive greatly reduced, owing to the alarm of the year before and the difficulty of getting cattle to the northwestern markets. Then, and until 1872, Abilene, Kansas, was the shipping point of the Texas drives, being then a station of the Kansas Pacific railroad near its western terminus, west of all the principal settlements, and with good water and abundant pasture. Here the traffic increased to 700,000 in 1871. In 1873

a See cattle drive, p. 21.

b Estimated for the years prior to 1859 when exports were not prepared and published, and for 1866 when no statement was prepared and published, and for the years 1861, 1862, and 1863 when no returns were received by the bureau of statistics.

was the next largest drive, being about 500,000, taken to Wichita, Ellsworth, and Coffeyville, Kansas. Thereafter no drive exceeded that of 1880, which was 384,147. Since the war railroad and sea transportation have figured largely in the Texas cattle traffic.

PASTURAGE.

Of the total area of the state of Texas about 139,000,000 acres were occupied, to a greater or less extent, by live-stock in 1880. In some portions, as notably in the counties of El Paso, Pecos, and Presidio, the occupation was very small in proportion to the pasturage, there being only about 15,000 cattle and 30,000 sheep to an area of 20,800,000 acres, of which 17,000,000 acres might be designated as pasture-land. If cattle only were counted, there were in that section of Texas over 1,100 acres of pasturage to each head, and counting sheep only, there were above 500 acres of available pasture to each head, or, rating five sheep equal to one "cow", there were some 800 acres of pasturage for each head of stock in the counties above named. As cattle in the whole of Texas occupy about 139,000,000 acres, while the sheep occupation is restricted to 125,500,000 acres, it follows that, beyond the limit shared by both, the cattle occupied, at the close of 1880, about 13,500,000 acres undisputed by sheep.

The further extension of the grazing area is largely dependent on the discovery of some successful means of obtaining water where grass can now be obtained. What is commonly known as the Llano Estacado or Staked Plains comprises within the state of Texas about 15,000,000 acres of table-land, elevated and dry. The descent on all sides of this plateau to the lower country around it is extremely rugged. Broken peaks project from the outstretching spurs, while the main lines of bulwark are cleft here and there by cañons, sometimes but a few rods wide at the base, and inclosing pasture several miles in breadth, watered by occasional springs.

J. G. McCoy, who carefully explored the Panhandle and adjacent Texas during the autumn of 1880, reports two notable instances. One is along the Red river. "The valley is about 90 miles long by from 10 to 20 miles broad. The side walls rise perpendicularly to a height of from 600 to 1,000 feet, constituting impassable barriers and inclosing a magnificent pasture of many thousands of acres. It includes all the watered portion of the immediate section of country, and is owned and occupied by a single firm, which holds 20,000 head of cattle." The other instance, in the Panhandle, about 101° 20′ longitude and 34° 20′ latitude, near the head of the South Fork or Pease river, a branch of the Red river, is in what is known as the Queta Que country. "In this inlet from the plains a gentleman has purchased about 150,000 acres for a cattle-range. This country is known as the roughest and most broken in the Panhandle, being cut up by gorges and cañons." At the sources of the Brazos river, between 101° and 102° longitude and 33° and 34° latitude, is also a similar instance; the diminutive streams which form the sources of the Brazos river between the one hundred and first and one hundred and second meridians and the thirty-third and thirty-fourth parallels furnished the only water within a wide range of country where luxuriant buffalo-grass, covering a breadth of from 50 to 75 miles, furnishes grazing. Pasture, however, 10 miles from water is valueless for cattle, except in winter.

In the southern part of this region Mr. McCoy reports that "good water can be gotten plentifully by digging from 4 to 20 feet, usually 6 to 8, and on the north, beyond the heart of the Llano Estacado", *i. e.*, beyond that part which is absolutely arid and desert. "West of the Red river country several chains of detached lakes exist. Many of these lakes were never known to dry up, it is said, and they afford water for thousands of cattle that drift out upon the plains in summer from the Texas frontier, and for large numbers of sheep coming in from New Mexico, both returning to the broken country and the lower prairie as winter approaches."

Judging from the fact that cattlemen are each year moving farther and farther within the borders of the Staked Plains, and finding water in springs and water-holes, and luxuriant grasses, and from the reports of Mr. McCoy, who states that these conditions exist far beyond the present limits of occupation, not more than 7,000,000 acres of the Llano Estacado within the state of Texas can be regarded as an absolute desert, destitute of forage. Beside these 7,000,000 acres there are probably 3,000,000 acres of arid and barren lands in detached pieces here and there in the state west of the one hundredth meridian. Beside these areas of actual desert there are probably about 19,000,000 acres which, having grass, are at present unavailable because without water.

THE PANHANDLE.

The name Panhandle is applied to that part of Texas projecting northward between Indian territory and New Mexico.

The plains and other level portions of the Panhandle are grassed chiefly with the grama and buffalo grasses. There are a few other varieties, growing sparsely. Upon the bluffs and high rolling portions the sage predominates, with some intermingling of buffalo-grass. The northeastern corner or nearly one-fifth of the whole Panhandle is infested by the loco, a weed pernicious to young stock, especially in the spring. The southeastern corner produces much coarse sage-grass and but little of the short grasses, such as grama and buffalo grass. This kind of grazing is not favorable for sheep. Winter and spring storms, too, are very severe here. For these reasons the flocks of sheep that have been brought in since 1876 were moving out in 1880, to find more favorable locations.

The northwestern corner, as the southeastern, is a level plain, richly grassed, but so deficient in water as to be practically unavailable for stock. This condition extends eastward through the upper tier of counties to Palodora

creek, in Hansford county. The southwestern part of the Panhandle, comprising the counties of Parmer, Castro, Swisher, and portions of Deaf Smith, Randall, and Briscoe, are within the boundaries of the Llano Estacado. Three-eighths of the Panhandle are at present unavailable for want of water. About one-tenth of one per cent. of the area of the Panhandle is timbered. In the cañons of the upper Red river there is cedar of large size. Bordering Wolf creek considerable cotton-wood is to be found. Throughout the Panhandle the only storm-breaks are those formed by cañons and gorges; for this reason heavy losses follow the "drifting" of stock before gales, such as those of November, 1880. The pastures of the Panhandle are also exposed to the ravages of wolves, which prey on the young stock. The occupation is principally by "squatting", though there are instances, as mentioned under the head of "Pasture areas", where land has been purchased at from 30 to 50 cents per acre. Along the Canadian river, for about three-fifths of the distance across the Panhandle, the bluffs are high and precipitous, exposing an outcropping of limestone. In Potter county they dwindle to hillocks and soon disappear. The soil of the Panhandle seems to be composed, when not sandy, of vegetable mold and disintegrated limestone. The valleys are rich. The bed of Red river is a red clay. This section of Texas is much better adapted to cattle than to sheep. While the former occupy about five-eighths of it, the latter are held on little more than two-fifths, principally in the east and west central parts.

The state has 3,050,000 acres located in the Panhandle, and private parties have also taken up land along the streams to a great extent.

BETWEEN THE ONE HUNDREDTH MERIDIAN AND THE PECOS (EXCLUSIVE OF THE PANHANDLE).

As we go southeastward toward the Brazos the meridian of 101° 30′ is the average western limit of stock occupancy, from which cattle increase in density eastward. There is a sheep district in and about Crosby county; otherwise, cattle have almost sole possession west of 99° 30′. Within the occupied area we find a very dry country north of a line extending diagonally from Mount Cooper, in the southwestern corner of Garza county, to the mouth of Buffalo creek, in Wilbarger county, although both forks of Pease river and the headwaters of the Big Wichita flow through this region. This has a rough, broken surface of red, sandy soil, often worn into cañons by the rush of waters during the rainy seasons. Notwithstanding the usual dryness of this tract of country, the forage growth is considerable. Beside the "black grama" and some buffalo-grass, the mesquite shrub abounds, bearing in the early autumn clusters of pods, which are said to equal Indian corn in fattening properties.

When, in 1874 and 1875, the first white settlers came into this region the mesquite, which was found in scattered clumps almost everywhere, was growing to the height and spread of a ten-year-old apple-tree, this growth being principally on the uplands. It furnished the pioneers with fence-rails and fuel. When cut there sprang up from each root from five to twenty-five shoots, which bear the annual crop so beneficial to stock.

South and east of the dry region above indicated the country is better watered and not so broken. The basin of the upper Brazos river is a broad fertile valley, varying in width from one to five miles. Eastward the black grama-grass is less abundant and sage disputes possession with it. This is the earliest grass and is the best spring and summer feed. Buffalo and grama grasses become valuable when the first frosts have dried up or killed the sage. Those ranges are the most valuable where both flourish. Where the buffalo and grama grasses and mesquite prevail no winter feed is required for sheep, but east of longitude 98° 30′ cotton-seed and prairie hay are serviceable, if not essential.

The sheep business is in its infancy in this section, but the country is as well adapted for sheep as for cattle. The great drawback to northwestern Texas is the bad character of its water. All the rivers and many of the creeks are more or less alkaline. In and about Baylor county they are called "croton" creeks, from their effects upon man. The upper Pease and Wichita waters are impregnated with salt, gypsum, and alkali. They are offensive to both taste and smell. Nevertheless it is asserted that their effects are not permanently injurious. Both here and in the Panhandle there are areas of abundant mast for hogs, from the scrub oaks, and the mesquite with its beans; there are also many wild plums. In 1879 the mast crop failed.

Nine-tenths of the stock occupation is by "squatting". A large part of the grazing extent, bounded on the west by the Pecos and the Rio Grande and on the east by longitude 100°, is unavailable for stock because destitute of water; nevertheless, the occupied country is not, on an average, stocked to more than half its capacity. This is true of nearly all of the western half of the counties above Tom Green; also of the western three-eighths of Tom Green county, and the northeastern half of Crockett county. What remains, though rich in grasses and forage plants, is very dry.

Toward the north are the sources of the Colorado river; on the southwest border the Pecos and the Rio Grande, and the sources of the Nueces in southeast Crockett; but these are inadequate water-supplies for the extent of pasture. About Fort Concho and Ben Ficklin, the county-seat of Tom Green, there is more open mesquite country, which becomes rugged in every direction except eastward, and rises about ten miles away to low, broken mountains topped by table-lands ("mesas"), and irregularly cut by verdant valleys. Eastward is the Concho

valley, more extensive and richer than those in the west. The soil is generally a sandy alluvium. Farther west, in Tom Green, the country decreases from hilly ruggedness to gentle undulations, but the soil grows poor and sandy toward the wastes of the Llano Estacado, while water is found at wider intervals and is impregnated with alkali. Generally in this region the running streams, always small, flow over rock surfaces. Beside this and the rivers before mentioned are springs, ponds, and water-holes, of which only a few last through the hot weather.

The mesquite bush is found everywhere. Along the streams grow pecans, oaks, elms, and hackberry. In Tom Green and Crockett counties the grasses are the mesquite (*a*), both curly and jointed, black grama, buffalo, and sage, with occasionally others of less value. Farther south, along the Mexican border, in Kinney and Maverick counties, occurs the prairie grass, which is cut for hay to supply government posts, and other plants of special value to stock are found, as the "juahia", the "sotal", the "nopal" cactus, the "saladio", the "baradulcia" or greasewood. The first is eagerly sought by cattle and sheep in the spring, when it furnishes a juice of the taste and the color of milk. The second, which resembles the Spanish bayonet, so common all over Texas, growing usually on gravelly spots and other poor soils, is very fattening. The shepherd cuts off the top of strong thorns with his "machette", a heavy sword-like knife, that his sheep may get at its juicy, nutritious interior. Where both sotal and nopal cactus are found, sheep will thrive without water for a long time.

The "baradulcia" or greasewood is extremely palatable and nutritious to stock in winter. In times of drought the many varieties of plants other than grass, growing to greater or less extent in all the border counties of the Rio Grande along its whole extent to the Gulf, contribute greatly to the value of pasture. The only available grazing in Crockett county is along the Pecos, and between San Pedro or Devil's river and the Pecos the country is exceedingly rough.

In portions of the country near Mexico, the depredations committed by thieves who cross from the south side of the Rio Grande often make the property if not the lives of stockmen insecure.

In those parts of western Texas where there are both sheep and cattle, the former are much more numerous than the latter, and though their occupation is confined to the eastern half of Tom Green, to Nolan, and parts of Mitchell and Fisher in the north, and to the counties of Kinney and Maverick in the south, they outnumber, by nearly 100,000 head, the neat stock, whose range is much more extensive.

There are a few sheep along the Pecos in Crockett county.

WEST OF THE PECOS.

This section has, perhaps, the least stock facilities of any equal grazing area in the state, because of remote situation, exposure to Mexican and Indian depredations, great dryness, and the broken character of the country and uneven quality of the pasture. Close along the Rio Grande, where the land is not too rugged and rocky to afford access to the river, the grasses are excellent. Ten to twenty miles back from the river there is generally good pasture, but with the drawback of limited water.

The Pecos bottoms, above latitude 30° 30′, furnish pasturage in many places. Extending east about latitude 30° 50′, for 40 or 50 miles from the boundary between Presidio and Pecos counties, there is a stretch both arid and barren. Elsewhere over southwestern Texas we find smaller patches of like character. There is little timber, with the exception of dwarf cedar in the mountains, and some pines on the northern slope of the Guadalupe mountains, and on the southwest boundary of Pecos county. In Presidio county the best watered grazing is found in the southern half, where many small streams rise which run toward the Rio Grande.

The corresponding region of Pecos county and the eastern slopes of the Guadalupe mountains furnish pasture with comparatively good water facilities. The dryest and least grassed region of Presidio is in the northwest below the Sierra Diablo, where the valley stretches north to the salt lakes. The "gramas", the "mesquites", and some little "buffalo" are the grasses of this section, the "black grama" prevailing over the Rio Grande half of the country.

In the broad valley lands running for nearly a hundred miles, and with a width of 30 miles on the east side of the Chinati and Capote mountains, there is good grass, but this entire region is almost destitute of water. From all surface indications, however, the mining and the railroad engineers, who surveyed the country in 1879 and 1880, state that an abundance of water will be found at but little depth.

SOUTH OF THE NUECES.

The region south of the Nueces river, bounded on the west by the Rio Grande and by the one hundredth meridian, has a very even character of good pasture over its entire extent, excepting where the Rio Grande border, averaging 10 miles in width, is overspread by a too dense growth of cactus, chaparral, and mesquite bush. The last two growths are spreading and injuring the quality of the pasture for cattle-grazing.

a A grass and a shrub have each the name mesquite.

The four counties of Nueces, Cameron, Hidalgo, and Starr, near the coast, contain 75 per cent. of all the cattle in this section, Nueces alone having 46 per cent. In these counties, south of latitude 30°, and as far west in Starr county as Rio Grande city, the soil is wholly alluvial. From the last point limestone comes in and stretches northwestward, covering the northern portions of Hidalgo and Cameron. All over the alluvial soil the mesquit is the prevailing grass. But in the north of the two counties just named, and extending far into the Nueces through what is called "The Sands", we find the most abundant and valuable forage to be what are rather indefinitely defined as sage and salt grasses. The names given for the forage plants are necessarily indefinite, owing to the variable use of the same name in different localities and by different people, Mexican or American. Colonel Sykes, commanding fort Brown in 1879, in a report dated in October of that year, under the head of "grasses", after mentioning the counties of Cameron and Hidalgo as probably the best grazing region in the state of Texas, stated that "the most severe droughts scarcely affect the grass, which makes a good quality of hay * * * excepting a species of *salt*-grass that withstands all droughts and makes good pasturage at all times, but is not fit for hay." H. S. Rock, the post guide and scout at fort Brown, filling in a printed circular of pasture inquiries, wrote: "The sand region in northern Cameron is principally covered with a species of *sage*-grass, affording good pasture never affected by drought." Along the coast there also grows a burr-grass, very excellent for cattle and horses, but not good for sheep. There is some "grama" in the coast counties; it increases in quantity as we go northwest.

For accounts of the pasture in the region above Zapata county to the eastern boundaries of Maverick and Kinney, we rely chiefly upon the testimony of army officers and circulars, as the season of field-work in this part of Texas was unfavorable for pasture examination, following as it did a long period of drought, when the grasses were neither in flower nor in seed. First in order come the mesquit and the grama; next, the "gramille" (*a*) described by Captain Caraher, of fort McIntosh (in General Ord's report, June, 1879); "an articulated stock which rapidly spreads and takes fresh root in the soil from the joints, like Bermuda grass, and is particularly valuable, because no drought the country has ever sustained has entirely killed it. It is the best grass for horses and sheep." Other grasses named are the sachehuiste, wild rye, and wire-grass. In this section of droughts and insufficient streams recourse is usually had to wells about 50 feet in depth, but in the "sands" water is found at a depth of from 10 to 15 feet. Southern Texas has more sheep than any other section of the state, irrespective of area. Webb, Duval, Nueces, Starr, and Enciñal are the great wool counties.

EAST OF THE ONE HUNDREDTH MERIDIAN AND NORTH OF THE NUECES.

In this section of Texas, for about eighty miles in breadth along the Gulf, the fine, quick-fattening grasses flourish. These are juicy and luxuriant, putting cattle in sleek condition for near markets in summer and fall. In all the region between Matagorda, San Antonio, and Mason county, and a line thence northeast through Montague county to the Red river, we have a country of an average agricultural condition sufficient to distinguish its stock production from that of the general ranch system elsewhere. The farm in this region is the homestead, the supply station, the dependence. Here is the area of smaller but more valuable herds under closer care. Here are provisions for shelter and feed in times of storms and droughts. Here extent of pasture is replaced by the products of cultivation; after the farm crop is gathered the stock consume the gleanings. This region of farms and ranches combined in central and eastern Texas covers about one-half the available pasture area of the state. As we travel southward from its center we find the native plants of pastoral southern Texas beginning to appear.

West of the ninety-seventh degree of longitude are more of the rich, hardy, coarse, tuft and bunch-growing grasses of the elevated prairie ranges of northwestern Texas and the Panhandle. Over the north and middle portions of eastern and central Texas there are, beside some of the distinguishing grasses of the extreme sections, the mesquite, at home in almost every part of Texas, the blue grasses, and other cultivated herbage, as the clovers, orchard grass, timothy, herd and Hungarian grass, and millet. Agriculture over all the country that may be worth cultivation is much retarded, and the ranch interests are proportionally fostered by that policy of the state (*b*) which sells and rents the public and school lands in large tracts. Already we frequently find west of longitude 98° 30′ extensive areas, sometimes whole counties, in the possession of stockmen or associations of capitalists, who have in many cases inclosed these estates. The extent and regular succession of the investments already accomplished constitute a hinderance to the advance of agriculture.

Although the area of timber in the state is stated to comprise about 28,000,000 acres, not more than from 5,000,000 to 7,000,000 forbid pasture, and three-fourths of that is on the eastern borders of the state.

The movement of stock westward since 1876 has been very marked. East of a line running northeast from Eagle Pass on the Rio Grande through Mason, Weatherford, and Gainesville to Red river, stock has decreased in its ratio of annual production, cattle especially. West of that line, for the two or three tiers of counties down to the thirty-first degree of latitude, a balance has been maintained. Elsewhere over all of the state from the Canadian river to the Rio Grande the increase has been great, partly derived from the coast, partly from New Mexico and

a Probably "grama" grass.

b There are state lands, but no United States government lands in Texas.

Colorado. Various reasons have promoted a movement from the eastward: agriculture and fence laws both result in restraints on stock; wealthy, long-established proprietors extend their ranges by purchase and fencing; and the removal of the Indians in the northwest left room for open-range herding. There has been a movement of stock into this region from New Mexico, partly because of stock thieves and Indians in that territory, and from Colorado because of overstocked pastures.

For from 90 to 100 miles from the Gulf a rich belt of dense cattle occupation extends from the Rio Grande to the Sabine. It is an expanse of rich pasturage, almost unbroken except by rivers and lagoons, with markets by sea to Cuba and New Orleans and by land to the west and northwest. Agriculture limiting it on the north and the west will prevent its extension in those directions.

MANAGEMENT UPON THE RANGE.

A man about to enter on stock-raising on his own account may be supposed to have some experience with stock. He selects a location for a ranch where there is a suitable extent of grazing-range with water allowing for increase of his stock in the future. For cattle he will aim to control from 15 to 25 acres per head; for sheep from 5 to 15 acres per head. Throughout Texas he will possess by ownership or lease sufficient water-rights to control all the range he deems necessary for his use. Often he owns or leases and fences about one-half of the land used. In a convenient location he builds a rough house, generally of logs, corrals for stock, and whatever is necessary for simple home administration of a ranch. He must now decide upon a brand for his stock. This requires some ingenuity, as the device, whether letter or figure, or whatever else, must differ from all other brands in that section of the country. Beside the brand there must be a distinctive ear-mark or a "wattle" (*i. e.*, flesh-mark) cut elsewhere than in the ear. The brand and the mark are recorded in the county books, and a certificate is given for the same, in which way all right and title to all stock bearing the peculiar brand and mark, wherever found in the state, are legally assured to him. The conveyance, by articles of writing, of this brand is a title deed as effective as a land deed. If the sale is of a small number, or part only of a man's herd, the purchaser counterbrands. In other cases than those of conveying stock and of "road" branding preparatory to drives, the marking of cattle by irons and flesh-marks is done as soon as the calves are dropped or found.

As a rule, in Texas, the cattleman must keep his stock more or less under control, for which purpose his "cowboys" daily ride over the rounds to see that the fences are in repair, or patrol the limits of the range to prevent the stock overrunning the bounds or to drive them back. Under fence, one "vaquero" can care for several thousand head. Range-riding requires more men. Because of this constant oversight, which includes brandings as the calves are dropped, the practice of spring "round-ups" is uncommon, except in the Panhandle, where Coloradians and New Mexicans have introduced the custom. The large cattle-raiser breeds his own horses. A ranch of 10,000 head of cattle will need about 200 brood-mares. At least five horses are assigned to each "cowboy". The branding and breaking, with very little other care of the young horse stock, make what labor there is on the ranch beside that with cattle. The "breaking" for the saddle is usually intrusted to one "vaquero", specially skilled in horsemanship. The speedy, barbaric, but effective manner of tutoring a cow-horse gives an efficiency in the hard duties of their lot that no civilized education can give. The stock used is of Mexican origin, small, tough, spirited, active, and sure-footed. In many parts of Texas their only feed is grass.

The selling time is early in the year, when the drover visits the ranches to select what he wants for the demands of cities in the state, or for the ranchmen of Kansas, Nebraska, and Wyoming who wish to increase their stock, or to supply the contractors furnishing beef to the Indians, or to sell for the markets of Chicago and of Kansas City. Often the ranchman having a large number of cattle makes his own drive, under a foreman with road outfit, while he himself precedes them by rail to arrange the marketing.

Previous to 1873 stock roamed at will, and the control of cattlemen over all land within possible range was nearly absolute. There were no laws defining the relative rights of stockmen and of farmers. Vast areas were unused for agriculture upon which cattle found feed. The pioneer farmer was obliged to fence his crops to protect himself from the cattle in the vicinity, either upon land of private ownership or upon that which belonged to the state. With the extension of farming the discussion, so common in the experience of other new regions, began as to whether crops should be protected against cattle by the planters, or whether the cattle-owners should keep their cattle from damaging the crops. In 1873 the trespass law began to take effect; by this the cattle-owners were held responsible for the damage done by their stock to crops even without fence. As it was enforced more vigorously farming extended, and the cattle-raisers were obliged to fence or to "line-ride" to keep their cattle from trespassing. With the necessity of fencing, purchase becomes important and the responsibilities of the ranchmen are increased. Those who can not or will not adapt themselves to the changing order of things push out farther upon the frontier. Public lands are less and less available. The common order in the progress of agricultural civilization is often first the exclusive occupation of a region by cattle, next sheep, and last agriculture.

Although the average situation of the cattleman in Texas is on purchased or leased land, yet this estimate for investment is made on the basis of "free range", in order to present the simplest scale for comparison. It may perhaps be assumed, moreover, that in case of purchase or leasing and fencing, the cost of land and improvements,

including taxes and interest, will be balanced by the enhanced value of the property at the close of five years, by the advantages gained during that term of occupancy in less amount of labor, smaller losses from theft and wandering, and the owner's exclusive use of his bulls.

PLANT.

Cabins, stable, and corrals	$700 00
Wagon, mules, and harness	350 00
25 horses, at $30	750 00
5 saddles, bridles, and equipments	150 00
Sundries: ropes, ranch tools, etc	50 00
Camp outfit	50 00
1,000 three-year-old cows, at $9 50	9,500 00
40 bulls, at $20	800 00
	12,350 00

Free range, 30,000 acres.

Beginning with such an investment the annual current expenses of management will be somewhat as follows: Two hands, monthly wages, $25 each and board, $10 each, $840; cook, monthly wages, $20; board, $10, $360; taxes on 1,040 head of cattle, $125; 50 sacks of salt at $2 50, $125; horseshoes, $112 50; total, $1,562 50.

At the end of five years, calculating upon the basis of making no sales and with exemption from all serious casualty, the herd may be estimated to reach a total of 4,812 head, distributed as follows: Calves, 1,157; yearlings, 914; two-year-old steers, 352; three-year-old steers, 285; four-year-old steers, 285; old cows, 773; young cows and two-year-old heifers, 992; old bulls, 30; young bulls, 24; having in the mean time purchased 25 additional bulls.

CATTLE-RAISING.

THE PANHANDLE.—The Panhandle of Texas was first partially stocked in 1876. In November, 1877, Mr. Charles Goodnight located a herd of 2,200 head of cattle at the head of Red river, in the so-called Palo Duro cañon, having entered the Panhandle from southern Colorado. That region has been rapidly stocked since both by natural increase and by purchase, mostly from lower Texas, and in July, 1880, the time of this investigation, there were, as the reports showed, 225,857 head of cattle in this part of the state.

The intelligence and enterprise of the Panhandle stockmen are very noticeable. Several successful efforts have been made to improve herds by the use of Kansas and Missouri high-grade shorthorn bulls. The second cross between such shorthorn bull and the Texas cow was estimated in the best-conducted herds to average, on the range, 1,100 pounds at three and one-half years of age live weight, while the native Texan steer of the same age, under the same circumstances, only attained a weight of 825 pounds. Many cattlemen, who have engaged in the business with large capital, have secured a title to their stock-ranges by purchase of state or of railroad land. The further improvement of the herd beyond the first cross of the shorthorn bull and the Texas cows does not bring, it is claimed, a proportionate increase of good qualities, since the high-grade cow fails to thrive as well as the half-breed during seasons of greatest scarcity of feed, not being, in the vernacular of ranchmen, as good a "rustler" (*a*) as the "straight Texas" or as the half-breed.

The failure to obtain a high percentage of increase, the severe storms of early spring, and the presence of the gray and the black wolves in many sections, materially lower the calf-branding of many herds.

No stock-cattle are marketed from the Panhandle. The beef produced is driven to Dodge City, Caldwell, or Hunnewell, in Kansas, and from these points much is shipped to Kansas City and beyond. It will be noted from the above that the region is occupied by ranchmen furnishing as yet only fat beeves fit for the market of that season, a business, in general, distinct from that of the lower Texas cattle-growers, and encouraged by the advantages of climate, grazing, and adjacent railroad transportation, found in the Panhandle, and by the fact that as yet the region is not fully stocked. The average wages paid here to cowboys is $30 per month, with board, costing $10 per month, added. The home ranch and the stable are generally comfortable structures of logs. The former, in some cases, is built of adobe and sometimes takes the form of a "dug-out". The corrals are built stockade fashion, while the food furnished to the stock hands is in greater variety than is usually found in a Texas cow-camp. The cattle are not handled during winter, nor is line-riding or loose herding practiced strictly, but an oversight of the range is maintained, as far as can be done in a region exposed to storms before which stock drift.

The scattering of stock incident to the seasons, and the practice of allowing the cattle to take pretty much their own course in winter, require a systematic method of rounding up in the spring and at different times during the summer and fall. All the stockmen of a certain section of country co-operate in this work, each man furnishing his wagon and outfit of men, who, working in harmony with others, under a "captain of the round-up", gather and brand the young calves and return to their range the cattle of the band they are handling. After the general "round-up", (*b*) the beef cattle are gathered by the same system and started for the shipping points of the Atchison,

a This vernacular word is written as universally pronounced in the West. It comes, however, from "wrestle", to strive or contend for.

b The term "round-up", as used in the eastern counties, is nearly synonymous with "rodeo", as used in the western counties, with this difference: "Rodeo" is used for great gatherings of cattle when the proprietors over a wide area join, while "round-up" is applied also to even the gathering by a single owner for branding, selecting beeves, etc.

Topeka and Santa Fé railroad. During the fall and winter, when the stock receives least attention, one rider to 1,200 or 1,500 head of cattle is employed, but in the spring and summer two or three men to the same number of animals are actively engaged on the range. Such saddle animals as are in use in the cold season are generally fed corn, which costs the ranchman 2½ to 3 cents per pound laid down at his camp. The Panhandle has proved to be a very favorable stock section, its chief disadvantages being the spring storms, the prevalence in some parts of the large wolf, and the existence in the northeastern portion of the loco.

Considerable loss has already been sustained in the Panhandle from the Texas fever, contracted from herds driven from lower Texas. The average annual loss on adult acclimated cattle from all causes in the Panhandle is placed by ranchmen at not over 5 per cent. On herds from lower Texas a loss of 10 per cent. is usually experienced the first winter. Losses at the hands of stock thieves, when cattle range far out on the edges of the Llano Estacado, occasionally swell the amount beyond the average figure. At the date of this research the stockmen were making an effort to secure legislative protection from the inroads of lower Texas cattle during the summer months.

BETWEEN THE ONE HUNDREDTH MERIDIAN AND THE PECOS RIVER (exclusive of the Panhandle).—In the region immediately south of the Panhandle, and extending also east of the one hundredth meridian, were the homes and the hunting grounds of the Kiowa and the Comanche Indians until 1874 and 1875, when they were subdued and removed to reservations in the Indian territory. It was not, however, until a year or two later that the country attracted any considerable attention. As early as 1872, Skard Brothers located their present ranch in Wichita county, where they were alone and exposed to Indian depredations for several years. Next Daniel Wagoner brought in from Decatur a stock of cattle 20 miles lower on the Wichita river. The great live-stock market established in western Kansas had given a powerful impetus to cattle-breeding in Texas, while the rapid settlement of the central part of the state by agriculturists obliged stockmen to look elsewhere for new grazing sections. These causes, and the practical settlement of the Indian question, excited in 1877 and 1878 an exodus of cattlemen and herds from other parts of Texas, a movement which still continues. No stock-cattle were driven in 1880 from this region to the Kansas market, the country receiving, on the contrary, many herds from nearly every part of Texas except the Panhandle. Only fat, mature cattle were driven into Kansas, the cost of driving to the railroad at Caldwell or at Hunnewell being about 75 cents per head, and requiring thirty to forty days. The route taken by these beef herds was by way of Fort Sill to a junction with the Fort Worth trail near Rush springs, Indian territory.

Stockmen in the northern part of this region hold their ranges only by the insecure title of first occupancy, few of them owning the land on which their camps are located, and fewer still having a purchase-right to the territory pastured by their cattle. The log cabin, pole corrals, and limited camp outfit of a stock-camp of this section represent ordinarily an outlay of but a few hundred dollars. The average wages paid to experienced riders is $25 per month and board, the latter costing about $8 per month. In the line of provisions, the simplest articles only find place in these camps; flour, bacon, coffee, sugar, and sirup being the staples, while beef killed from the range contributes the remaining substantial food.

The cattle of northwest Texas are in a large measure controlled or held on their ranges by a system of "line-riding". The cowboys engaged in this work are called "line-riders"; they live usually in camps in the summer season and in "dug-outs" during winter, on the borders of the range. These camps are located some 20 miles apart, and each contains two men, who ride every day in separate directions half way toward the next station and effect a meeting with the line-riders of that camp. On the route they look for cattle or cattle-trails crossing the outside line of the range, drive back the stock in sight into their own pasture-grounds, or, following up the trails, recover such animals as have gone beyond. During the winter some corn is fed to such saddle horses as are required for this work, but the majority of the horses are wholly grass-fed.

The annual cost of merely holding a herd of 3,000 to 5,000 cattle in this part of Texas is stated to be 75 cents a head, against $1 in the Panhandle, but the beef-cattle when turned off are worth only $20 each, while the Panhandle beeves bring $23 each in the Kansas market.

The annual increase among the herds of this section is stated to equal 85 per cent. of the number of breeding cows, a high average arising from the favorable nature of the ranges, which furnish a good quality of pasturage, and are generally provided with ample wind-breaks of mesquite and cedar, in which stock find shelter during hard weather. The trails or routes leading into this part of the state from central and lower Texas are so numerous that a correct tally of the drives into this region during 1880 was impossible. Stockmen best qualified to judge, however, affirm that fully 100,000 head of neat cattle were brought in and permanently located for breeding purposes during that season.

CATTLE-DRIVE.

Though the producer sometimes takes his own cattle to the northern markets, they are usually taken by a special drover. Taking contracts to deliver stock-cattle to fill specified requirements of number, age, sex, and condition, young cattle to be grazed to maturity or young cows for breeding, or to deliver beeves (*i. e.*, steers and dry cows) for Indian agencies, packing-houses, and other slaughter, or, planning for his own account, to put on the trail what will answer profitably the demands he believes will arise, the drover, early in the year, goes to that region of the state where he expects to find suitable stock and visits the various ranches. Having

bought the cattle and arranged with the sellers to deliver his purchases on a fixed day at a certain point, he goes to some horse ranch and buys such a lot of horses as shall carry his drove through, say 40 horses for each average drove of 2,300 to 2,500 cattle. He also engages about a dozen cowboys for each such drove, at the rate of $25 to $30 per month, and a "boss" drover as captain and field manager of the stock, equipment, and men, at $90 per month. Having made these engagements, and purchased camp-wagon, team (four mules or four oxen), cooking utensils, and other necessaries of an outfit, he is ready to receive his purchases, only enough coming in at a time to make one drove, which is road-branded, and is then started out on the trail. So the deliveries go on until all his droves are under way. When first put on the road the cattle are closely guarded and driven briskly for several days, until the danger of their breaking away for home is passed. For the first few days at sunset the drove is "rounded up" compactly, and half of the men, relieved by the other half at midnight, ride round and round the bed-ground. This labor decreases as the cattle become tractable, and two men at each watch are then sufficient to guard them through the night. The ordinary order of march is the foreman ahead, searching for camping place with grass and water; the drove drifting onward in the shape of a wedge, the strong few stretching out to a sharp point in front, then the line growing thicker and wider, until in the butt end is crowded the mass. On each side of the lead rides a man on "point", that is, to direct the column. Back where the line begins to swell ride two more at "swing", further back ride two at "flank", and the remainder are on "drag", (*i. e.*, about the rear,) to push on the march. These positions give *cowboy rank*. The "greenhorns" or "tender-feet" serve at "drag", while the cowboys experienced in driving hold the places at "point", the post of honor. These distinctions are observed at mess and bed. One man drives the horse herd apart from the line of cattle, or, with large bands, two men are employed. The distance traveled each day is 12 or 15 miles, according to grass and water. At daybreak the cattle are moved off the "bed-ground" to graze, and while the two men who were last on guard remain with them all other hands breakfast. The first to finish breakfast relieve the guards on duty and allow them to come in for their morning meal. Then, the horses being caught and saddled, and the cook having cleaned up, the drive is started and continued until about eleven, when the cattle are allowed to graze again, and lunch or dinner is eaten. Immediately after that the men who are to stand first guard at night, and who also act as horse-herders, go on ahead with the mess-wagon and the horses to the next camp, where they get supper, so that when the herd comes up they are ready to "graze", and hold it until the first relief of the night. The bed-ground is, when possible, on an elevation, with space sufficient for all the stock to sleep. The men off guard roll themselves in their blankets without removing their clothing and lie down on the ground near the camp-fire to sleep.

These are the ordinary details of a drive from Texas. Departures are made from this custom according to circumstances and the different degrees of skill of drovers. A herd traveling with calves cannot make 12 miles per day. A "mixed" herd—that is, one made up of various ages and of both sexes—is the easiest to control; a beef-herd of four-year-olds is the most difficult. The slightest disturbance at night may stampede them. The first symptom of alarm is snorting. Then, if the guards are numerous and alert, so that the cattle cannot easily break away, they will begin "milling", *i. e.*, crowding together with their heads toward a common center, their horns clashing, and the whole body in confused rotary motion, which increases, and, unless controlled, ends in a concentrated outbreak and stampede. The most effectual way of quieting the cattle is by the cowboys circling around and around the terrified herd, singing loudly and steadily, while, too, the guards strive to disorder the "milling" by breaking up the common movement, separating a bunch here and there from the mass and turning them off, so that the sympathy of panic shall be dispersed and their attention distracted, as it is in part, no doubt, by the singing. The somber surroundings of a wild country at night, with the accompanying strange sounds—the tramp, the clashing of horns, the bellowings of alarm, and the shouted song of the cowboys—are very weird.

The cattle business of the interior was dimly suggested in the experience of the ox-teams of the Mormons in 1847 and of the California gold-seekers soon after. Up to that time there was no definite movement for cattle-raising in the far west. In a little more than thirty years stock-raising has become a business west of the 95th meridian, producing in 1880 between $225,000,000 and $250,000,000, not only aiding greatly in the supply of food for our own people but adding largely to the food available for export.

Among the pioneer stockmen of Texas the names of Goodnight, Chisom, Dawson, Piper, and McKee are prominent.

In 1859 John C. Dawson made what is said to have been the first drive of stock to Colorado from northern Texas or Indian territory. He came out of Indian territory into Kansas on the 96th meridian, and drove north across Walnut creek about 35 miles above its confluence with the Arkansas, thence across the Little Arkansas, at or near where Sedgwick City now is, to the Arkansas river at Big Bend, up the Arkansas, generally on the north side, to Pueblo in Colorado. From Pueblo he struck north on the east bank of the Fountain qui Bouille creek to the present Little Buttes, where he turned off east to the heads of Squirrel creek and northwest across the divide and down Cherry creek to its mouth, where Denver has since become a great city.

The droves northward in the summer of 1880 were tallied as they traversed Indian territory and Kansas. One hundred and three droves were driven on the drovers' account. Their destination and their character are shown in the following table. The cattle sold in Kansas City brought there for three-year-olds an average of $21 per head; for four-year-olds, $22 50; for dry cows, $14 50.

ONE HUNDRED AND THREE DROVES ON DROVERS' ACCOUNT.

	DESTINATION.				
	To Nebraska, Wyoming, Dakota, and Montana.	To Upper Missouri Indian agencies for beef.	Direct into Indian territory for breeding purposes.	To Colorado for stocking.	Sold in Kansas City.
Yearlings	49,777		11,052	2,050	
Two-year-olds	52,870		11,092	1,250	
Three-year-olds	18,080	13,508	870	1,075	26,990
Four-year-olds	10,470	7,821	748	200	21,007
Dry cows	11,606	8,671	811	525	3,069
Cows and calves	518		31	400	
Number of cattle (225,109)	143,330	30,000	25,213	5,500	51,066
Average cost of driving, per head	$1 97		$0 06⅞	$1 50	$0 62½
Number of droves (103)	33	(*)	15	4	51

* The animals of this column are included in the previous column.

Beside the above 103 droves taken on the drovers' account there were 28 droves driven on contract and 33 droves driven for breeding purposes, aggregating 164 droves and 384,147 cattle. There were driven to Kansas 123,038 head, of which 58,000 were sold for stock purposes and 24,831 for beef in Indian territory, and 40,207 for stocking in Kansas. The composition of these 164 droves is shown below:

	Number.	Per cent.		Number.	Per cent.
Total	384,147	100	Three-year-olds	66,087	17
			Four-year-olds	43,237	11
Yearlings	124,007	33	Dry cows	30,060	8
Two-year-olds	116,824	30	Cows and calves	2,972	1

All the yearlings and two-year-olds above specified and about one-third of the remainder, or 75 per cent. in all, were for stock purposes, or for grazing, and 25 per cent. were for slaughter, either at once or according to the demands for beef at the Indian agencies of the upper Missouri river and Indian territory.

These droves averaged 2,342 head each, and required the services of 1,968 men, or an average of 12 men to a drove. The number of saddle horses used was 6,494, an average of 3.3 horses to each man. The estimated loss in driving to Kansas was 6,000 head. To drive from southwestern Texas to the vicinity of Ogallalla, Nebraska, for Nebraska and Wyoming required about 90 days. To drive from Texas to Fort Dodge, or to Caldwell for Kansas City, required 35 days; to Pueblo, Colorado, 75 days.

Of the above cattle 25,633 were from the Panhandle; 54,147 from Texas south of the Nueces river, and almost two-thirds of the whole from the regions east of the 100th meridian. The cattle sold in Kansas City for beef were from the Panhandle and that portion of Texas contiguous to the Red river. The cattle driven to Nebraska, Wyoming, and Montana were practically stock cattle. A large number of cattle were sold in Kansas to be driven back into the Indian territory for stock purposes by reason of changes of demand arising late in the season. The cattle sold in Kansas for beef in the Indian territory were bought by contractors for the agencies.

The following table exhibits the "drive" of Texas cattle to various points for the respective years, as derived from records of each year:

For Sedalia, Missouri: (*a*)		
1866		260,000
To Abilene, Kansas:		
1867		35,000
1868		75,000
1869		350,000
1870		300,000
1871		700,000
		1,460,000
To Wichita and Ellsworth, Kansas:		
1872	350,000	
1873	405,000	
1874	166,000	
1875	151,618	
		1,072,618
To Dodge City and Ellis, Kansas:		
1876	322,000	
1877	201,159	
1878	265,646	
1879	257,927	
		1,046,732
Dodge City, Caldwell, and Hunnewell, Kansas:		
1880		384,147
Total for 15 years		4,223,497

a The cattle did not actually go to Sedalia, but were diverted by trouble about Texas cattle, etc.

If we estimate the average net selling price at $12 per head, the amount realized by "Texan drovers" for stock driven north for fourteen years ending December 31, 1880, was $47,561,964.

SHIPMENTS BY SEA.—The first shipments of live-stock from Texas, by sea, of which we have any definite knowledge, were made in 1851 from the port of Galveston to both New Orleans and Cuba. Just what number was taken to each of these markets is not a matter of record, as the customs districts make no returns prior to the year 1859. It has been ascertained on good authority, however, that the traffic attained no very considerable dimensions until 1865, when extensive shipments were begun to the island of Cuba. At that time average shipments were made of from 1,200 to 1,500 head of cattle per month, 200 to 300 beeves to the cargo being carried. The table below, furnished by Mr. Joseph Nimmo, jr., chief of the bureau of statistics, gives, in so far as recorded by the customs districts, a numerical and financial statement of the numbers of cattle, sheep, and hogs exported from the state since 1859:

RETURN OF EXPORTS OF CATTLE, SHEEP, AND SWINE FROM THE CUSTOMS DISTRICTS OF TEXAS DURING EACH YEAR ENDING JUNE 30, FROM 1859 TO 1880, INCLUSIVE, AND DURING SIX MONTHS ENDING DECEMBER 31, 1880.

Fiscal year ending June 30—	CATTLE.		SHEEP.		SWINE.		Total value.
	Number.	Value.	Number.	Value.	Number.	Value.	
Total	246,617	$3,532,390	821,930	$846,323	6,315	$27,557	$4,406,270
1859	80	1,500					1,500
1860	335	6,700					6,700
1861							
1862							
1863							
1864	517	5,000					5,000
1865							
1866							
1867	960	17,110	543	2,580	41	328	20,018
1868	7,065	50,122	3,156	2,253	52	117	52,492
1869							
1870	18,299	118,703	27,481	18,189	170	517	137,409
1871	10,810	85,511	36,247	32,837	39	141	118,489
1872	7,268	72,942	27,228	25,843	51	127	98,912
1873	13,543	184,871	57,217	59,935	626	3,177	247,983
1874	28,280	381,979	111,445	110,290	706	2,108	494,377
1875	33,045	463,225	95,710	97,597	1,683	9,380	570,203
1876	30,355	486,168	45,149	46,235	910	3,632	536,035
1877	20,396	338,235	108,747	108,629	348	1,998	448,862
1878	23,333	492,456	102,649	111,718	388	1,849	546,023
1879	24,503	427,676	80,829	96,406	954	3,196	527,278
1880	17,789	309,443	99,986	108,316	287	793	418,552
Six months ending December 31, 1880	9,439	150,689	25,543	25,495	60	194	176,378

Exports of articles by customs districts were not prepared and published prior to 1856. For the fiscal years 1856, 1857, and 1858, it appears by the records that no animals were exported from the customs districts of Texas. In 1866 no statement by customs districts was prepared and published, and no returns were received from Texas during the years 1861, 1862, and 1863, and for 1869 the numbers were not given. In the present conduct of the trade with Cuba cattle shipped are purchased and transported, under contract with the government of that island, by the Morgan Steamship Company. The special means of transportation furnished by this line of vessels, added to the quarantine restrictions on returning transports, has driven all lesser competitors out of the business, and the Cuba live-stock supply is now mainly under its control. Formerly several other contractors, using sailing vessels, shared with the Morgan line the risks and the profits of the traffic.

Indianola and Galveston, on the Texas coast, are the principal shipping points to both New Orleans and Havana. The average voyage of a steam vessel to New Orleans is made in two days, and to Cuba in four. Cattle shipped to New Orleans are not usually provided with feed during the trip, but an ample supply of bedding is furnished, which litters down their pens 5 or 6 inches deep. Owing to their wild nature, Texas cattle rarely eat heartily during a short voyage like that to New Orleans; hence no regular allowance of feed is carried for them. The voyage to Cuba, being of longer duration, requires the provision of from 15 to 20 pounds of hay per day for each bullock, which, after the second day, when subdued by hunger and accustomed somewhat to their unusual situation, they consume greedily. Cattle are carried by the Morgan steamers both between decks and on deck,

elevators being in use to lower them into the vessel, where pens are fitted for confining them. During the passage the crew of the vessel, or special attendants, feed and water the animals. The average loss from natural causes is not over 1 per cent., but accidents incident to loading and unloading the wild and terrified beeves sometimes swell this average greatly, while the shrinkage on steers of 900 pounds live weight during the Cuban voyage has been found by frequent tests to range from 100 to 125 pounds under the most favorable treatment.

The rate of transportation to New Orleans by steamer is $6 per bullock.

In 1878 the Morgan Steamship Company contracted to supply the government of Cuba with cattle averaging 900 pounds live weight, for which they were to receive $43 in gold per head. The terms of their present contract are supposed to insure a slightly increased valuation, to wit, about $45 in gold per bullock. The class of cattle most in demand in Cuba are four and five year old steers, though bulls and stags find a ready sale, being used on the large plantations. Prime cattle of the first description cost in Texas $15 to $17, bulls and stags bringing lower prices. It is claimed by the Morgan Steamship Company that, in consequence of the increased shipments of live cattle from Florida, and of the growth of a trade in refrigerated meats from New York to Havana, there has been a marked decrease in the export of live cattle to Cuba compared with that of three years ago.

From Mr. Ruff, of the firm of Robinson, Ruff & Borden, which was the chief competitor of the Morgan Company, the following particulars relating to the export of cattle by sailing vessels to Cuba were obtained: Mr. Ruff entered the business in 1875, using his own schooners in transporting cattle to Havana, and confined his attention entirely to that trade; between May and October the easy sea voyage, the condition of the beeves, and the demand in Cuba are all favorable to transportation by sailing vessels; the quarantine regulations which delay vessels returning from Cuba have made a burdensome expense to small exporters. The Morgan Steamship Company, with frequent and rapid trips, taking cattle only as an incident of trade, has therefore controlled most of this traffic. In January, 1880, Mr. Ruff was making his first shipment for the year; his cattle averaged 1,000 pounds live weight and were in fine condition, the coast pastures on which they were fattened having been uninjured by the frosts of the previous fall. He paid $2 per 100 pounds for breeders for these beeves, of which from 200 to 250 head constituted a cargo for his schooners, and the voyage required on an average from seven to ten days. It was claimed that no losses were incurred from natural causes when the vessel experienced fair weather on her voyage, but that loss from injuries received in handling the animals at the time of shipment and unloading materially affected the profits. The cost of transportation was placed at $10 per head; this included feed and attendance on the voyage and all expenses involved in shipment, except the custom-house charges at Havana, which were $6 per bullock. The average cost, therefore, of placing a beef in Havana amounted to $16, which, added to the first cost of a thousand-pound bullock, put the expense to the exporter at $30 on the Havana dock. Mr. Ruff claimed that the transportation of live cattle by sailing vessels was more satisfactory than by means of steamships, for the reason that in storms schooners, not being obliged to make the fast time required by the mail contracts held by the steamship company, could lay off and prevent the heavy rolling of the vessel, so disastrous to cargoes of cattle carried by steam vessels. As a case illustrating this fact he cited the instance of a severe gale to which a Morgan steamer and one of his own schooners were both exposed. The steamer lost 150 cattle, while his sailing vessel lost but one. The voyage on that occasion took fifteen days, but in consequence of the scarcity of beeves in Havana his cattle sold for $105 per head, having suffered but slightly from the inclement weather experienced. Mr. Ruff was then (January, 1880) negotiating with the Texas government to establish a shipping point at Sabine Pass, where no quarantine regulations existed to embarrass individuals engaging successfully in the business.

Three establishments, one in each of the counties Aransas, Fayette, and Robertson, according to manufacturing report Tenth Census, slaughtered during the fiscal year ending June 30, 1880, 16,688 beeves, 300 sheep, 375 hogs. There were 1,036,600 pounds of beef sold fresh, 5,990,000 pounds canned, 72,000 pounds salted or cured; 13,000 pounds of mutton sold fresh; 5,700 pounds of pork sold fresh, 1,000 pounds salted; 14,000 pounds bacon and hams; 6,450 pounds of lard; aggregate value of all products, $486,400.

The following tables present the weight and value of animals as specified and the composition of certain herds:

ESTIMATED AVERAGE VALUE, 1880.

Breed of cattle.	Bulls.	Cows.	Three-year-old steers.	Two-year-olds.	Yearlings.	Calves.	Beeves.
Native Texans	$15 00	$9 45	$11 20	$8 84	$5 86	$4 00	$14 65
Improved stock of Panhandle	75 00	20 00	25 00	18 00	18 00	10 00	30 00

WEIGHTS AND VALUES FROM ACTUAL SALES OF TEXAN BEEVES IN CHICAGO AND KANSAS CITY DURING THE MONTH OF NOVEMBER, 1880.

Source of information.	Breed of cattle.	Number reported.	Average live weight.	Average selling price.
			Pounds.	
Chicago stock-yard	Native Texan beeves	15,325	868.35	$24 06
Kansas City yard	do	2,291	862.03	20 47
Kansas City yard	Panhandle beeves	210	937.85	24 05

ESTIMATED AVERAGE LIVE WEIGHT OF CATTLE ON RANGES.

	Yearlings.	Two-year-olds.	Three-year-olds.	Beeves.	Four-year-old cows.	Three-year-old cows.	Two-year-old heifers.	Yearling heifers.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Native Texas cattle	350	540	745	900	750	650	500	325
Improved cattle of Panhandle	.....	.....	1,050	1,200	.....	.....	.....	.....

COMPOSITION OF CERTAIN HERDS DECEMBER 31, 1879.

Class of stock.	Number.	Per cent.
Total	189,551	100
Bulls	3,791	2
Cows	66,343	35
Three-year-olds and beeves	18,955	10
Two-year-olds	24,642	13
Yearlings	28,433	15
Calves	47,387	25

Percentage of calves dropped per 100 cows, 80; percentage of calves branded to these 80 dropped per 100 cows, 71.42; percentage of calves actually surviving to become yearlings, 70; percentage of average annual loss among cattle over one year old, 5.

The native Texas cattle are well described by Lewis F. Allen (*American Cattle*, 1879) and James McDonald (*Food from the Far West*, 1879) as tall, lank, bony, coarse-headed, high at the hocks, low on the rump, with immense spreading, half-turned-back horns; flat sided, sway backed, with narrow hips and quarters. The meat is coarse, cannot be marbled, and the amount is small in proportion to the offal. The average live weight at home of native Texas beeves is about 900 pounds. Improvement by breeding can be insured to that class of thoroughbreds of which the crosses will acclimate; by limiting the wandering to find feed; by restricting the service of the good sires to the cows for which they were intended. The last two points cannot be reached with cattle on free range. The Texas cattle form a valuable basis upon which to cross the improved stock, securing hardiness from the native cows and symmetry and better quality from the sires.

DISEASES OF STOCK.

The diseases of stock in Texas as well as in other districts in the United States have been carefully investigated by special commissions and otherwise to such a degree that, beyond a reference to the treatment of losses, it seems best only to refer here to some of the more prominent reports that have been made on the subject. Such are, the reports of Professor Gamgee on the splenic or periodic fever of cattle, published in 1871, in the report of the Commissioner of Agriculture on the diseases of cattle in the United States; report of J. R. Dodge on the statistical and historical investigations of the progress and results of the Texas cattle disease, published in the same volume; and Dr. D. E. Salmon's investigation of southern cattle fever, in the report of the Department of Agriculture on the contagious diseases of domesticated animals, 1880.

SHEEP.

The growth of the sheep business cannot be detailed like that of cattle. The census returns give Texas 100,530 sheep in 1850, 753,363 in 1860, and 714,351 in 1870. Mr. J. R. Dodge's estimate for 1878, which is generally accepted, is 3,674,700, increasing the return of the state for that year 985,993; that is, he estimates that the

returns made for taxation did not represent more than 73 per cent. of the number of sheep in the state. In 1880 the returns show 75.85 per cent of the estimated number. The census enumeration is of stock "on farms". This special investigation embraces also stock held on the ranches and on ranges.

Sheep were probably brought into Texas by the Spaniards, but, requiring more care than cattle, they did not increase like the stronger stock up to 1850. The early Spanish sheep, the "chourros" or "chaurros", had degenerated, from neglect, to be small, scrubby animals, bearing not more than a pound or a pound and a half each of coarse wool; but, in their uncared-for condition, obliged to hunt feed and water, resist storms, and protect themselves and their lambs from wild animals, they developed those characteristics which distinguish them as the "mother" stock of the present sheep of Texas. Upon this light, dry, thin-fleeced, native stock, about 1850 there began the crossing with the American merino, by which the present stock has been produced with good-sized carcass and long-fibered wool, strong constitutions, the disposition to care for their young, a density of fleece, giving weight and protecting their bodies from storms and the wool from dirt.

From 1850 to 1860 we find that the number of sheep increased nearly sevenfold. From 1860 to 1870, taking the statistics of the terminal years only, there is a slight decrease, in consequence of the war, in both the number of sheep and the clip of wool. In 1880 the number of sheep was double that of 1870, while, according to commercial estimates, the annual wool-clip had increased from 7,000,000 to 22,000,000 pounds.

Though the commercial estimates, over a term of years, present for the past the easiest attainable table of the general growth of the sheep industry, yet they cannot be safely employed as a basis for estimating the number of sheep for any one year in particular states and territories, because these estimates include the wool from pelts (*i. e.*, from sheep skins) and also credit a state with the amount of wool it sends out without regard to the amount produced in the particular state. A certain amount of wool annually comes into Texas from Mexico to be marketed, and is counted in the clip of Texas. The same matter will receive further illustration in other states.

ESTIMATED ANNUAL WOOL-CLIP OF TEXAS FROM 1867 TO 1880.

[Prepared from estimates of Mr. James Lynch, of New York.]

	Pounds.
1867	7,000,000
1868	8,000,000
1869	7,000,000
1870	7,000,000
1871	8,000,000
1872	9,000,000
1873	9,000,000
1874	10,000,000
1875	12,000,000
1876	13,000,000
1877	14,000,000
1878	17,000,000
1879	16,000,000
1880	22,000,000
Total for fourteen years	159,000,000

With the estimated number of sheep in 1880 (4,457,323) the shear of 4.94 pounds per sheep would be required to produce the commercial estimate (22,000,000 pounds) of wool in Texas. The investigation by the Commissioner of Agriculture in 1878 indicated an average of 3.5 pounds per sheep. Returns from the best sheep-growers in the state make their wool-clip 4.13 for 1880, which would give an aggregate of 18,408,744 pounds. The difference between this amount and the commercial estimate may be largely if not entirely accounted for, as the wool sent out from Texas would include wool from pelts and wool grown elsewhere, but reaching the general markets through Texas.

In the fiscal year ending June 30, 1880, there were imported into Texas 1,314,666 pounds of wool, as follows: Customs district of Brazos de Santiago, 406,487 pounds; Corpus Christi, 876,005 pounds; Saluria, 30,974 pounds; El Paso del Norte, 1,200 pounds.

The estimated annual shear of the different grades of Texas sheep is for Mexican sheep (one-sixth of the whole) 2.17 pounds; half-breed Mexican (or five-eighths of the whole), 3.17 pounds per head; grades above half-blood, 4.75 pounds per head.

WOOLEN MANUFACTORIES, TEXAS.

Years.	Establishments.	Hands employed.	Sets of cards.	Wool used.	Value of all material used.	Value of all manufactured products.
				Pounds.		
1870	20	100	20	278,045	$86,817	$152,908
1860	2	43	4	81,000	25,980	38,796
1850	1	8	.....	30,000	10,000	15,000

TEXAS SOUTH OF THE COLORADO RIVER.—The system followed in Kinney county furnishes the best type of sheep husbandry for the entire region south of the Colorado.

The party engaging in the business, having first secured, by purchase or lease, a complete or partial stock-range, invests either in some local flock or buys from drovers bringing in sheep from Mexico. If a sufficient acreage is not obtained he relies for further pasture upon adjacent unoccupied state land. The practice of holding land by purchase or lease is general among sheep-owners; that of fencing in large tracts is not so general, as Kinney county is not agricultural and furnishes but little timber for fencing. A division of the pasturage into winter range near the streams and lowlands, where the brush affords shelter, and into summer range farther inland on the prairie country, is usually made. The feed consists of the varieties of the mesquite grass, vine, curly, pointed, and bearded grama grass in the western part of the county, and during winter in the brushy range of the sotal, juahia, nopal-cactus, the saladio, the baradulcia or greasewood, and other native plants.

The flocks occupy the winter range from December until shearing time, and occupy the summer pasture-grounds the remainder of the year.

About September 20 the merino rams, purchased for the purpose of improving the stock, having been prepared for three or four weeks by a daily feed of oats and corn mixed, are placed with the bands of ewes. The rams are admitted each night to the ewes, which are corraled for that purpose, and at daybreak they are removed and fed, when the ewes leave the pens for the range. This routine goes on for from six to eight weeks, when the rams finish their term of service, and the flocks seek the winter pastures. The less careful practice of breeding is that of introducing the rams during the proper season, without previous feeding or care, and allowing them to remain herded with the ewes. After removal, usually on the 20th of November, the rams are recuperated by a daily feed of grain for a few weeks. The different classes of sheep are herded by themselves in bands of from 1,200 to 2,000, each under one shepherd, the former number being preferred on a brushy locality. Small owners of not over 2,000 sheep generally run all except the rams in one band, to curtail expenses.

Just before lambing begins (February 15) three additional men to each band of ewes are hired to assist during the six weeks of that season. The ewes in flocks, commonly of 1,000 head, or in case of extra fine sheep, 500, are now carefully watched day and night by the regular shepherds and the assistants. After the first ten days the shepherds are busy in the work of castrating, marking, and tailing the young lambs, care being taken to apply remedies against fly-blow on the mutilated parts. This work continues until all the spring lambs have been dropped, when about April 15, or May 1 in late springs, the whole stock is ready for shearing. The wethers and dry stock are sheared first, the ewes with lambs last, to avoid loss of increase likely to ensue if the mothers are too early separated from their young. The extra helpers during lambing, no longer needed, have been dismissed or re-engaged to act as shearers. The sheep brought from the winter range to the home ranch are corralled for shearing; the shearers tie them down as needed, shear and release them, while the flock-master and others in attendance receive, tally, tie up, and bag the freshly-cut fleeces. The sheep having been sheared—a labor of some two or three weeks—the whole flock, or such sheep as require treatment, are dipped in a tobacco wash, and then taken to the range used in summer. After four and a half months, or during August, the lambs are weaned by separation from the ewes, and are placed in flocks of 1,000 by themselves, or, on some ranches, with about one-tenth their number of old wethers, that lead the young sheep to good feed, and make the herding easier. Early in September the flocks, including the lambs, are again sheared, and if there is scab they are redipped. The rams at this time are once more prepared for service, and subsequent to the breeding term the whole body of sheep re-enter the winter grazing grounds. The custom prevails with many flock-masters of breeding such ewes as have failed to lamb in February or April during May, so that a fall lambing season in September requires extra help, the same system of management that obtains during the spring lambing and shearing, but on a smaller scale, being then necessary.

On some extensive ranches of southern Texas the enormous number of sheep held, and the many employés required to carry on the business, are such that an elaborate system of administration is necessary for the successful management of the property. The following account of the methods practiced on one ranch was obtained from a careful inspection on the ground through the courtesy of the proprietor. The "Callahan ranch", located in Enciñal county, is an unfenced property, holding at the time 100,000 sheep, more or less, a partially improved stock and undergoing further grading by the use of merino rams. The chief aim of the proprietor is to produce wool, but the wethers are sold to northern buyers when the market makes this advisable. Some 60 miles square of range are traversed during the year by the flocks. The terms given in the description of the management are Mexican, and are given as pronounced in the corrupt Spanish of the ranch.

Lowest in executive rank are the "pastores", or shepherds, each having charge of about 2,000 head of sheep, which he accompanies by day and camps with by night, moving on foot and assisted by his dog. Over every three pastores whose flocks range in the same neighborhood a "vaquero" is appointed, who receives higher pay, and whose duties require him to exercise a constant surveillance over the flocks under his charge, and to render monthly accounts to the "caporal", who is next in authority. The caporal is mounted, and gives his time and attention to the three vaqueros, who, with their respective subordinate pastores, are under his superintendence. The caporal thus directs the movements of about 18,000 sheep, and by constant riding is familiar with the location on the range of each flock, and can direct their removal to other pasture grounds, return those sheep that have strayed, and

watch closely the work of those under him, besides turning in each month the accounts received from the vaqueros to the "mayordomo". This official is the highest in authority of those who handle the stock of the ranch; a man of long experience and skill in the conduct of the practical part of sheep-husbandry, and one able to deal with the class of men employed to carry out his orders. The mayordomo is constantly on the range, going the rounds of the different camps, noting the condition of the sheep, suggesting changes of range, and receiving from the caporals the monthly accounts, all of which he hands in each month to the general ranch superintendent or administrator, beside suggesting many things requiring attention, such as the discharge of incompetent shepherds, hiring of additional hands, etc. The caporals see that their camps and their subordinates are supplied with provisions, drawing the same from the home ranch by permission of the administrator. The books of the establishment are kept by this latter personage, who furnishes supplies, makes payments, and conducts the general financial business. The employés are all Mexicans except the administrator or agent, who directs the whole business, with the advice and authority of the proprietor.

At the lambing season, in February and March, the additional help required swells the force of the employés to about three times its usual size, and at shearing-time one hundred and fifty men have to be engaged especially for this work. The same systematic management is noticeable at this latter period, when the shearers and their helpers work under the direction of the administrator and the mayordomo, each fleece being credited to the man shearing it, and tallied and bagged for shipment.

Sheep have maintained their ascendancy over cattle in southern Texas along the Rio Grande (cattle are worth $15 to $18 each south of the Rio Grande) because the difficulty of driving sheep into Mexico and the low value of that stock protected them from Mexican marauders. Sheep, moreover, can find a variety of pasture in the thickets bordering the river, more suitable for them than for cattle.

While cattle will not readily eat after sheep, the latter, by sharp tramping, close feeding, and the tearing out of grasses in a dry, light, thin soil, soon destroy pasture that would feed cattle for a long time, but they improve it for both grazing and farming, where the earth is strong and deep. Here they do not pull the grass out by the roots, and their small hoofs harrow in the seed and plant it, and they manure the soil.

The following narrative of a sheepman in San Saba county is given as a picture of the methods and results of his business as seen by himself:

OCTOBER 1, 1877.—Purchased this day 1,000 ewe sheep that will shear 4 pounds of wool to the animal. I did not purchase land, for the reason that there are large tracts of land vacant and belonging to individuals who do not live in the state, which I have utilized by locating on the same near a "cedar brake", which affords ample protection for my stock from storms in winter. I have built a log-cabin, 8 by 10 feet, and 4 feet high. A ridge-pole runs across the center, raising it 3 feet above the walls. The roof is formed by stretching a wagon-cover over it, and the gable ends are made of cloth, and the cabin is without floor or door.

INVESTMENT.

1,000 sheep, averaging 4 pounds wool per head, at $3	$3,000 00
20 merino rams, at $15	300 00
Hire of two men to build pens and camp	2 00
Shepherds (wages, $12; board, $6), at $18 per month	216 00
1,200 pounds salt, at 2 cents	24 00
Cooking utensils	3 00
Shot-gun	10 00
Two quilts for bedding, at $2 50	5 00
Ax, $1; bell for sheep, 75 cents	1 75
Wagon-cover	2 50
Ammunition for gun	1 00
Total	3,565 25

The herder is now prepared to get along without further assistance until March 1 by doing his own cooking. The flock is turned out of the "pen" at daylight, the herder keeping in front of his flock, instead of behind it, so as to keep the fast sheep back and enable the poor or weakly ones to keep up with the flock, the herder gradually falling back as the sheep approach him, so as to retard their movements. By eleven or twelve o'clock he has reached a "water-hole", when the sheep are watered and allowed to *shade up* under the trees from one to three hours, after which they are taken back to camp by a different route from the one traveled in the morning, for the purpose of securing fresh pasturage on the way. The distance covered each day from camp to "water-hole" and return is about 6 miles. A good shepherd will not pen his flock until the sun sets, as it is better they should be kept feeding up to that time.

We salt our sheep every Saturday, allowing about 5 gallons of salt to 1,000 sheep, and mix with it a few pounds of ashes and sulphur. If the sheep are troubled with grub in the head, we mix with the salt a few pints of soot, taken from the stove or chimney.

Commencing at camp No. 1, October 1, we continue to use it until the 1st of November, and then move to camp No. 2, about 6 miles distant. These alternate monthly changes are continued until the 1st of March, being obliged to water at the same "water-hole" on account of a scarcity of water.

We will now suppose the 1st of March to have arrived, and find it necessary to employ a Mexican and his wife; build several small pens for the accommodation of the ewes that will not claim their lambs, and two other larger pens. These pens are built of brush, and at little expense, a man building one in one or two hours. About the 15th of March the ewes begin to drop their lambs at the rate of 50 to 80 per night; the ewes, with their lambs, being kept separate from the main flock until about one week old, when they are put with the older lamb flock, herded by the Mexican. We now have three flocks, viz, flock No. 1, main or dry flock, attended by the regular

herder; flock No. 2, composed of ewes with lambs one week old and upward, and herded by the Mexican; flock No. 3, composed of ewes with lambs just born, and herded by the Mexican's wife until one week old. This is kept up until the lambing season is over, which is about April 15.

The shearing season now being at hand, we engage men, who usually come to our camp for that purpose, paying 4 or 5 cents per head, after which our wool is shipped to market, freight 50 cents per 100 pounds.

Preparations are now made to travel with the sheep during the summer, for which purpose we retain the Mexican and his wife, at an expense of about $16 per month and board, and find it necessary to buy the following outfit:

One wagon	$60 00
Pair of native ponies	50 00
Harness, rope lines, chain tugs, etc	4 00
One dozen bottles of medicine for killing the screw-worm	1 50
Total	115 50

The different bands having been put together, the Mexican drives the flock and his wife drives the team, the "boss" going on ahead for about 6 miles from where camp was broken, where he builds a brush pen for the night's encampment, completing which, he returns to the flock and assists in driving the sheep, which travel along leisurely, feeding as they go, until their arrival at the new camp, about sundown.

Long ere this the Mexican woman has arrived at camp and prepared supper for the party upon their arrival.

By sunrise the next morning the flock is started and moved about the same distance as the day previous, and this is continued for about two or three weeks, or until arriving in a section of country where there is plenty of water and grass and no likelihood of interfering with cattlemen. After remaining two or three weeks we pull up stakes and move on, continuing to move the stock, as found necessary from time to time, until the 1st of September or October.

The flock having been brought back to the vicinity from where they were started in the spring, the rams are put in with the ewes and allowed to run with them about a month, when they are taken out and returned to the farmer who has been keeping them in his pasture during the year at a small expense.

October 1, 1878, we find ourselves back in the old camp, one year after embarking in the business, at about the following expense:

Dr.

Oct. 1, 1877. Original investment in stock, camp outfit, wages of shepherd for one year, etc		$3,565 25
Mar. 1. Wagon, $60; pair of ponies, $50		110 00
Harness, $4; medicine, $1 50		5 50
Wages of Mexican and wife from March 1 to October 1, seven months, at $16		112 00
Board of same, seven months, at $10		70 00
Grain fed to rams while running with ewes		20 00
Shearing 1,720 sheep, at 4 cents		68 80
Hauling 5,875 pounds of wool to market		29 38
Public weigher, weighing 24 sacks, at 10 cents		2 40
Cost of 24 sacks, at 60 cents		14 40
10 pounds twine, at 15 cents		1 50
Needle for sewing sacks		10
		3,999 33

Cr.

May 1. Sale of wool from old ewes, 4,000 pounds, at 25 cents	$1,000 00	
Oct. 1. Sale of wool from 750 six-month-old lambs, averaging 2½ pounds, 1,875 pounds, at 25 cents.	468 75	
Oct. 1. Value of stock at expiration of first year:		
950 old ewes, at $3	2,850 00	
750 six-month-old lambs, at $3	2,250 00	
20 merino rams, at $15	300 00	
Value of outfit:		
Shot-gun	10 00	
Bedding, $4; ax, 50 cents; bell, 75 cents	5 25	
Wagon, $50; wagon-cover, $1 50	51 50	
Span of horses	50 00	
Harness	3 00	
Net profits first year to balance		2,989 17
	6,988 50	6,988 50

These figures pertain to an exceptional condition, when there is no crowding of the pasturage, and when no particular casualty interferes with the best attainable results.

The conflicting interests of cattlemen and sheepmen on government lands often lead to acts of intimidation and even of violence before laws or imperative customs have become established.

Shearing.—The practice of shearing twice a year is general in southern Texas; the spring shearing begins, with dry sheep, sometimes in the latter part of February, usually between April 1 and May 1, sometimes in late springs extends to the 20th of June; the fall shearing usually occurs during September, often during the early part of October, and rarely in the early part of November.

The contingencies connected with sheep-raising are such that expenses in detail will vary with each one's experience, but the following outline may be suggestive as a basis of judgment. The investment may be, for example:

5,000 three-quarter merino ewes, at $2 56	$12,800 00
150 merino rams, at $24 23	3,634 50
640 acres of land, with water privileges, at 50 cents per acre	320 00
Buildings and fences	250 00
Equipments, horses, wagon, harness, tools, and dogs	500 00
	17,504 50

The following may be the expenses for the first year: Foreman (average wages, $21; board, $5), at $26 per month, $312; cook (average wages, $13; board, $5), at $18 per month, $216; two shepherds (average wages, $13; board, $5), at $18 each per month, $432; ten extra men for five weeks during lambing, at $18 each per month, $225; shearing 4,568 sheep, including board of shearers, $185; rent of range, 24,360 acres railroad land, at 1.5 cents per acre, $365 40; dipping 4,568 sheep, at 5 cents, $228 40; salt for 4,568 head, 5,481 pounds, at 2 cents, $109 62; taxes on sheep, $145 76; corn, 140.62 bushels, $140 62; other ranch expenses, at $25 per month, $300; total, $2,659 80.

In successive years the expenses of shearing, dipping, salting, and taxes increase with the number of sheep; 8,000 acres of land additional are rented for the second year, and nearly as much in addition for the third year. At the end of the third year the stock will occupy nearly 40,000 acres of land, with four shepherds instead of the two employed at first, and the total flock, presuming on no disasters of any kind, will be composed of 8,072 sheep, distributed as follows: 3,490 old ewes, 1,108 young ewes, 1,108 young wethers, 1,108 yearling ewes, 1,108 yearling wethers, 150 rams; the sales of wool, meantime, 18,860 pounds first year, 27,000 pounds the second year, and 33,000 pounds the third year.

Figures for a flock beginning with 2,000 ewes and 60 rams, and kept three years, as taken from the books of one of the best managed firms of the state, show an annual profit of 21 per cent. upon each year's capital. The firm has about 10,000 sheep. The figures are given for sheep on lands not fully stocked, with ample room for the growth of the business.

NORTHERN TEXAS.—The only flocks here referred to in the Panhandle are those of Mr. A. B. Legard, which aggregate some 15,000 sheep, and are held 25 miles west of Tascosa, Oldham county. Having tried sheep-raising in both Colorado and New Mexico previous to entering the Panhandle, he regards the latter section as an excellent sheep region, although the pasture and climate are perhaps not more favorable for sheep than for cattle. He states that the chief losses arise from the unfaithful and inefficient character of the labor. Mexican herders are hired, as white help is unattainable; a few Indians are employed, and make good shepherds. Starting with Missouri sheep, Mr. Legard has constantly bred them to Vermont, New York, and Michigan Spanish merino rams purchased in late years at $35 per head. The average yield of wool in 1880 was 4¼ pounds to the fleece. This was sold to buyers on the line of the Atchison, Topeka and Santa Fé railroad, to be marketed eventually in Philadelphia. The wethers are driven to the railroad and sold to feeders and shippers. In the management of his sheep Mr. Legard pastures about 2,500 in each flock during fall and winter. Three Mexican herders attend each flock, and are paid $15 each per month, board costing $4 75 extra per month per man. Just before lambing the ewes are divided into flocks of 1,200 head, and additional help is engaged in carrying the stock through this period. The expenses incident to the business are rather above those incurred in southern Texas. When on the range the flocks are moved often enough to change their grazing grounds twice a week, the shepherds using the Mexican donkey with which to pack the articles of their camp outfit—a method of transportation necessary on account of the rough character of the country, and adapted to the frugal habits of the Mexican shepherd. Mr. Legard, as stated, breeds his ewes to high-grade Spanish merino rams, using three to each hundred ewes. He states that his drop of lambs is 90 per cent. of the ewes, 67 per cent. of which (or 60 per each 100 ewes bred) survive as yearlings. Severe storms in the spring usually cause a heavy percentage of loss among the young lambs, and wild animals prey on both young and adult sheep. The wool, a medium-grade merino, has averaged well during the four years that the stock has occupied the Panhandle, and has been sold unwashed at an average of 21 cents per pound.

Immediately east of the one hundredth meridian and south of Red river sheep-raising had reached considerable importance in only one county (Throckmorton) in 1880. Several flocks of moderate size were found in Montague and Clay counties, and one flock in Baylor county. It may be said that in the thirteen counties from meridian 97° 30′ to the one hundredth meridian and north of the thirty-third parallel, including those just named, there were no sheep in 1875. The flocks now there have come from lower Texas, New Mexico, northeastern Texas, Missouri, and in one instance from Oregon.

The soil, grasses, climate, and shelter are all favorable to sheep in this part of Texas. The chief aim of the proprietors was found to be wool-growing, though they were beginning to give attention to mutton also. Attempts were in progress to grade the flocks by using Spanish merino and cotswold rams, the former breed being greatly preferred.

In northern Texas, south of the Red river, the estimated average weight of wool was, for New Mexican sheep 2½ pounds; merino grades, 4 pounds; Missouri and native, 3 pounds; and cotswold grades, 4 pounds. The estimated average live weights of mutton sheep were: New Mexican, 75 pounds; merino grades, 90 pounds; Missouri and natives, 85 pounds; cotswold grades, 112 pounds.

The average increase among sheep in this part of Texas was found to be 75 per cent. of the breeding ewes, in large flocks of 2,000 head and more. Among smaller and more carefully handled flocks of ewes of 1,000 head or less the proportion of lambs saved was found to be fully 85 per cent. of the ewes, not reckoning barren ones. Over most of Texas the winter of 1880–'81 is now known to have been unusually severe, but the snow storms were less damaging to sheep than cold rains sometimes are, and the average losses were not much increased according to report.

The prices of common Mexican sheep are as follows: Rams, $1 50; ewes, $1 20; wethers, $1 45; and lambs, 56 cents. The estimated live weight of wethers is 75 pounds; dressed weight, 36 pounds. It is impracticable to classify the improved sheep in Texas, but the price is increased according to grade, and the weight of the wethers is increased with better breeding.

The composition of 71 flocks of Texas sheep, aggregating 139,968 head in 1880, was: Rams, 2,594, or 2 per cent. of the whole; 63,310 ewes, or 45 per cent.; 33,105 wethers, or 24 per cent.; 40,959 lambs, or 29 per cent. Estimated number of lambs dropped to each 100 ewes was 83. Of these 63.71 survived to yearlings. The estimated average annual loss among adult sheep was 11.30 per cent. from disease, winter storms, wild animals, and poisonous weeds.

DISEASES.

Among sheep in Texas inflammatory diseases and typhus fever are unknown. Scab, rot (usually called liver-rot), and worms of two kinds, as described below, grub and hoove, are the only diseases reported in the state.

LIVER-ROT.—A flockmaster of San Saba county reports in 1877 a loss of 1,198 sheep out of 1,515 by liver-rot.

TAPE-WORM.—A sheep-owner in Hays county states that during the summer of 1880, which was very wet, he lost 45 per cent. of spring lambs from a cause not ascertained at the time, but which was attributed to wet. He writes July, 1881, that the summer has thus far been very dry, and that his lambs are dying a month earlier than in 1880. Upon examination he finds "in the small entrail, which is 100 feet long, and runs from the bowels to the anus, one or more worms of great length, white, very soft, one-quarter of an inch wide, and susceptible of parting at every eighth of an inch. I know no remedy, and the disease is very fatal. It is not identical with lombrez."

LOMBREZ, OR WORMS.—A correspondent at Corpus Christi says that this disease prevails in Duval and Live Oak counties, on the Nueces river, and in Nueces county, when rank grass is induced by much rain in the fall or latter part of summer. It affects the lambs first, and has destroyed during the fall and winter of 1880–'81 60 per cent. of the weaned lambs.

A flockmaster of DeWitt county says that his sheep are affected by lombrez, owing to heavy rains during summer; that when he has fed, during the winter following such wet seasons, half a bushel of corn to the head, the disease was checked.

A flockmaster of Nueces county reports that twice during fifteen years his flocks have suffered from lombrez.

GRUB.—One owner reports losses from grub in Kinney county.

HOOVE.—One owner of Coryell county reports some losses from this disease, which proceeds from feeding greedily on fresh clover, followed by distension of the paunch by gases released in the fermentation of the green feed.

GOATS.

Texas is one of the states in which attention has been paid to raising goats. Some Angora goats have been introduced with which to grade up the common goat for the wool or hair. The mutton of goats is largely used in some localities. The market for the fleece has been quite irregular, and the industry correspondingly fluctuating. While a few individual flocks have sometimes exceeded a thousand each, the aggregate in the state has not been very great.

SWINE.

In the management of hogs in Texas there is little that is peculiar or exceptional in methods, although they vary considerably. Moreover, although the number of swine is large, the whole product of the state is inadequate to the home demand. The total exports of live hogs by railroad and by sea for 1880 are recorded as 2,387 head with two other railroads to hear from, which may bring the total up to 3,000 head; and the total exports of bacon and hams for eighteen months were but 32,069 pounds, valued at $4,923, representing for the year 1880, say, 24,000 pounds, worth $3,700, or in all, live hogs and pork, a value of about $7,700. Opposed to this very small export Texas is reported by various good authorities to be receiving from $45,000 to $50,000 worth of pork and lard per week, or a value of over $2,000,000 per year.

SUMMARY OF MOVEMENT OF CATTLE, SHEEP, AND SWINE.

The figures of the drives of sheep in the past, as indeed of their railroad transportation beyond the state, are not available, but here are presented the number of sheep driven in 1880, the number transported by railroads the same year, and the number sent by sea since shipments began: Sent out by drives, 1880, 111,700; brought in by drives, 1880, 115,000; sent out by railroads up to August 1, 1880, 12,000; sent out by sea since commencement of the business, 821,930.

The markets for sheep for slaughter are the cities within the state, also Saint Louis and New Orleans. By sea they go to the north Gulf ports.

It is estimated that 4,000 cattle were driven to New Mexico, 7,500 to Arizona, and 22,000 sheep to Mexico. The total reported live-stock sent from Texas in 1880 may be thus summarized:

Sent from Texas.	Cattle.	Sheep.	Swine.
Total	500,875	249,229	2,387
By drive to the north	384,147	89,700	.....
By drive to the west	11,500	22,000	.....
By railroads	78,000	12,000	2,040
By sea	27,228	125,529	347

Texas received from New Mexico 15,000 sheep by drives in 1879; driven over the border from Mexico, 100,000 sheep and 1,500 cattle. A few improved animals were also brought by railroad for breeding purposes.

CATTLE, SHEEP, AND SWINE IN TEXAS AS REPORTED FOR CERTAIN YEARS.

Year.	Authority.	Cattle.	Sheep.*	Swine.
1830	Thrall's History of Texas	100,000	.....	.....
1850	Seventh Census (on farms)	330,114	100,530	662,022
1860	Eighth Census (on farms)	3,535,708	753,963	1,371,532
1870	Ninth Census (on farms)	3,990,158	714,351	1,202,445
1878	National Department of Agriculture	.....	3,674,800	.....
1878	State returns for taxation	3,512,412	2,088,702	1,057,935
1879	State returns for taxation	3,369,447	2,553,041	1,614,881
1880	Tenth Census (on farms)	4,084,695	2,411,633	1,950,371
1880	Tenth Census (on farms and estimated unenumerated ranch and range stock)	4,894,698	3,651,633	2,449,623

ESTIMATED CATTLE, SHEEP, AND SWINE IN TEXAS JULY 1, 1880.

Region.	APPROXIMATE ACREAGE OF STOCK OCCUPATION.		STOCK.		
	Cattle.	Sheep.	Cattle.	Sheep.*	Swine.
Total	139,000,000	125,500,000	4,894,698	3,651,633	2,449,623
Panhandle	10,000,000	6,000,000	225,857	121,023	1,000
West of one-hundredth meridian to the Pecos, except the Panhandle	16,000,000	7,500,000	488,976	264,273	4,107
West of the Pecos	17,000,000	17,000,000	17,000	29,540	847
South of the Nueces	13,000,000	13,000,000	221,597	1,644,268	4,944
East of the one-hundredth meridian and north of the Nueces	83,000,000	82,000,000	3,941,274	1,592,529	2,438,725

* The enumerators in 1870 were instructed not to count spring lambs, but in a considerable percentage of instances this direction was disregarded. The figures for 1880 are for adults only, being in fact the number of fleeces in the spring shearing of *farm* flocks.

Total land area of state	acres..	167,865,600
Total area of approximate available pasturage	do...	150,000,000
Total population		1,591,749

AVERAGE DENSITY OF STOCK (CATTLE AND SHEEP) OCCUPATION.—Making one head of neat stock the unit of stock, and considering five sheep to equal one head of cattle in consumption of pasture, we have 5,623,024 units of stock, occupying 139,000,000 acres, or 24.72 acres to the head.

In the various tables of stock occupation in this report the area of occupation comprises the extreme limits of cattle and sheep range over both summer and winter, and whether occupied solely by one kind of stock or in common by both. The area of available pasturage comprises all lands producing forage naturally and all lands under cultivation. The amount of land valueless for pasturage purposes is the difference between the area of available pasturage and the total land area, and is the aggregate of tracts both arid and barren, dense forests, regions inaccessible or above vegetation, and grass-bearing grounds where water is practically unobtainable. The difference existing between available pasturage and the area of occupation is the amount of wild pasturage suitable for grazing and not used in 1880.

NEW MEXICO TERRITORY.

HISTORY.

Authorities differ as to the year of the settlement of Santa Fé, in New Mexico, but it was before the year 1600. Domestic animals were probably introduced early in the occupation by white men, but beyond this general probability little is known as specifically applicable to that part of Spanish America now designated as New Mexico.

In 1694 General Varges, in his account of the capture of the pueblo of Iemez, mentions that among the booty were 176 sheep. In the history of the Spanish and Mexican rule, we find no other allusions to the stocking of New Mexico from the south, though the tradition is that importations with the different settlers and the natural increase had fully stocked the present New Mexico with sheep long before 1800, and that that stock numbered as many from 1825 to 1835 as in 1880.

In New Mexico sheep are far more numerous than cattle, and the raising of sheep is relatively more prominent than in Texas.

PASTURAGE.

Of the land area of New Mexico, 78,374,400 acres, 5,000,000 acres are estimated as worthless for pasturage, and 63,374,400 acres are estimated as furnishing grazing of some kind, from good grazing to the arid but often grassed plateaus of the Llano Estacado. Of the available pasturage nearly 13,000,000 acres are unoccupied, either because of the scarcity of water mainly in the southeast, or because of marauders, red and white, chiefly in the southwest. The best great continuous areas of good pasture are in the northern half of the territory, especially in Colfax, Mora, and San Miguel counties in the northeast. Eighty-three per cent. of all the cattle and 92 per cent. of all the sheep of the territory are located north of Socorro and Lincoln counties. Seventy-six per cent. of the 289,722 northern cattle are in the northeastern counties, Colfax, Mora, and San Miguel, while about 80 per cent. of the 3,900,106 sheep in the northern section are west of the Rocky mountains. In the southern half of the territory, not 15,000,000 acres are occupied by cattle, but the sheep, which are five times as numerous as neat stock, are scattered over 27,000,000 acres, their density reaching one head to 30 acres in the Rio Grande country of Socorro county, but over the rest of the southern section about one head to 197 acres.

Colfax is the great cattle county of New Mexico, while Bernalillo and Valencia stand first in density of sheep occupation. Doña Aña has the fewest cattle and Lincoln the fewest sheep in proportion to area.

Colfax and Mora counties and San Miguel down to the thirty-fifth parallel may be regarded as good pasturage, from which about 5 per cent. only of area can be excluded as worthless. The best, probably 20 per cent., lies on the Canadian and west Cimarron rivers, along the arroyos, the Plaza Largo, and the northern tributaries of the Canadian, and in many mountain parks. The worthless parts are comparatively small patches of dense pine and rugged heights in the mountains and arid sands in the east. The pasture is in rolling prairie and mesas and the finer denser-grassed mountain slopes and valleys. Many tracts are unavailable for pasture during part of the year because of want of water.

The Great Raton mesa is serviceable for five months in summer, but during the rest of the year it is too cold and exposed. It is mostly a sheep range.

Colfax county is equally adapted to cattle or sheep, except that cold storms in the eastern half harm sheep more than cattle, particularly if sheared in the fall. The tendency is toward an increase of neat cattle and the pushing of sheep to the counties south and particularly west.

The ridge along the division line of Mora and San Miguel counties between Canadian rivers and Ute creek secures warmer and more sheltered range south of it. Grazing areas are confined by the natural bounds of topography so that spring "round-ups" are much less necessary than in Colfax, Mora, and the northern part of San Miguel county.

The available cattle area of about 11,500,000 acres provides an average of 65 acres of grazing to each head if the pasturage were not shared by sheep, this occupation being proportioned 30 acres in Colfax, 63 in Mora, and about 100 in San Miguel. The available sheep area of about 12,500,000 acres provides an average of 20 acres to each head if cattle did not also occupy the pasturage, and the sheep density is proportioned 20 acres in Colfax, 17 in Mora, and 21 in San Miguel. Taking five sheep to represent one "cow" in consumption of forage, we have 24 acres to the unit of stock in Colfax, 35 acres in Mora, and 55 acres in San Miguel. Colfax seems stocked to its full capacity, and range is not what it was ten years ago nor even what it was in 1875.

The basin of the Canadian river is about 30 miles wide, with a high table-land, called locally "Big-flat", bounding it on the north and the Llano Estacado on the south. The white grama and other grasses common in

the Texas Panhandle prevail in this section, but the sage-grass, abundant east of Tuscosa, disappears near the New Mexico line. Passing west about fifty miles, the surface of the basin changes from rolling prairie of good grazing with frequent spring branches, to long, abrupt, deep arroyos, often dry, and to irregular hills and mesas, which seem detached areas of the Staked Plains. Upon these summits grazing exists, but the sides are almost bare of grass. The hills and mesas increase in number westward. Between the elevations are belts of grass, cut for hay.

The white grama abounds on the levels, while buffalo and black grama are the principal high-land grasses. Upon the ridges and rocky spots are several varieties of the cactus, the sharp barbed thorns of which, easily detached, trouble herdsmen and stock. In the rocky sides of cañons are found shrubby cedars and piñons which furnish shelter and the material for fuel and for corrals. In the arroyos and along the rivers there occasionally appear small clumps of cottonwood. Aside from these growths the country is not timbered, but the brakes and cañons afford refuge from the cold, dry storms. There is no poisonous water or injurious vegetation except a little loco.

In the Plaza Largo country, on the north border of the Staked Plains and 35 miles south of Fort Bascom, there is an inclosed tract of 64,000 acres, fenced for 23 miles with barbed wire, at a cost of $200 per mile, and defended over the remainder of its line by natural barriers. This is unsurveyed public land without water other than the artificial supplies furnished from wells and tanks, and distributed by pumps, windmills, and pipes. Two stockmen made this inclosure for the purpose of leasing its privileges over and above what their own stock (1,200 cattle in 1880) required. They were planning to take about 2,000 head more from outsiders on a contract which would give them one-half of the accrued stock at the close of five years, they assuming all care of the cattle during that time. With the facilities established for supplying water at points required for a uniform occupation of the grazing, the projectors expected to carry an average of about 4,000 cattle, or one head to 16 acres, without injury to the pasture As the men had no legal right to the land inclosed and improved, they sought from government a lease or sale of the tract.

An irregularly curved line running west and southwest from about 34° 30′ latitude to the average longitude of 103° 40′ and following that meridian to the Texas boundary includes the section of the territory lying in the Llano Estacado or Staked Plains east of the Pecos extending into Texas and south of the Canadian, and is practically unavailable for grazing. It is generally arid, although rarely entirely barren.

The entirely unoccupied portion of the Staked Plains in New Mexico comprises but about three-eighths of the extent usually included on the maps. Even within the heart of the Plains a small unbranded herd is occasionally discovered by some explorer, on some watered oasis, where the animals, straying from their companions during the wet winter time, have maintained themselves and increased. The Staked Plains, so far as grass alone is concerned, frequently possess good grazing, but water and shelter are extremely limited, though not entirely lacking.

Beside the occasional depression that preserves rainwater or the drainage of arroyos, there are occasional springs of good water along the walls of the interior plateau; but they are soon absorbed in the loose soil. There is good pasture on the north slope of the Llano Estacado about the thirty-fourth parallel.

From Fort Sumner eastward to Blanco cañon, about the meridian 101° 40′ on the White river in Texas, there is a chain of detached lakes, along the course of which a safe and direct journey may be made across the dreaded Plains.

The destruction of brush, shrubs, and other wild plants along the streams is perhaps the most important factor in the injury effected, for this diminishes a resource of stock in winter. The reduced grass constantly offering less resistance to the flow of surface water after heavy rains, gullies or wash-outs have injured the ranges. Travelers are often obliged by these gullies to make detours from their courses.

Farmers now cultivate the tracts on which the so-called "vega" grass flourished, once the main dependence of stock in April and May, before the June rains.

Santa Fé county, and eastern Taos, Rio Arriba, Bernalillo, and Valencia comprise the central northern section of New Mexico. There are great bodies of good pasture covering the lower lands and extending into the mountains and south into Socorro county. This north and south track is very sparsely watered, the living streams emptying into the Rio Grande being mostly on its west side. Taos valley and the mesa slopes of the La Canada and Nambe creeks offer many rich areas of grazing, though from Santa Fé to the Socorro county line, along the Rocky mountains, there is very restricted grazing, especially between the immediate border of the Rio Grande and the 106th meridian. From Albuquerque down the river there is a broadening agricultural valley averaging 2 miles in width. Rugged ravines become formidable cañons above the mouth of Santa Fé creek. Santa Fé county has but small area of good pasturage, and that is more largely grazed by sheep than by cattle.

The central district south of Santa Fé contains the principal ranches of the region.

The best pasturage of Valencia county east of the Rio Grande extends eastward over the Manzana range to about the 106th meridian, though there are arid and barren interruptions on the ridges. The timber is rarely dense enough to prevent grazing. East of the 106th meridian in both Valencia county and the narrow strip of Bernalillo there is coarse grass, but with few exceptions, as about Pedernal in the north and Los Posos Pinosos in the south, the only water, that of holes and springs, is alkaline.

In Taos, Rio Arriba, Bernalillo, and Valencia counties, west of the Rio Grande, to the Atlantic and Pacific divide, we have a country where streams and mountain ranges, all, except the San Mateo mountains, tend from northwest to southeast. It has a southeast exposure, and the great divide serves as a break to the cold storms. The divide marks a general line between the range of the Navajo Indian sheep and those of the white men. Most of central northern New Mexico lying on the east of the divide has a rough topography, sometimes deeply cut as in the long, narrow cañon Caperlin. There are but few unavailable heights or forests, but there is much troublesome brush that crowds out the better grass pasturage and tears wool from sheep.

Tracts of very good grazing are numerous but small. The largest good area in the north is southeast of old fort Lowell, southwest of Servilletta creek, and along the Cangilon creek and the Caliente to the Rio Grande; in the south are found good ranges in the country of the Rio Demez and the Rio Puerco. All between the divide and the Rio Grande and south of Colorado to Socorro is held by sheep to a density of about one head to 20 acres, whilst cattle in eastern Taos and Bernalillo have an occupation of but one head to an average of 160 acres, though in eastern Rio Arriba and Valencia counties their density is one head to 50 acres.

Northwest New Mexico, including about one-half the Navajo reserve and the counties of Taos, Rio Arriba, Bernalillo, and Valencia west of the divide, is pre-eminently the sheep region. Eastward to the Zuñi mountains just east of the 108th meridian there is good pasture. There are timber, arroyos, and barren exposed heights, but withal there is a variety of good pasture for sheep. Farther east to the divide and in Valencia county below the 35th parallel, nearly to the 107th meridian, is an arid country, through which there are only small and uncertain streams. South of the Rio San Juan the dry cañons, Largo and De Ojo Amarillo, make a partial barrier. Farther south in Rio Arriba county the cañon of the Rio Chaco renders that river inaccessible for miles on its north banks. East of the Navajo reserve but farther east and south of the cañon water is found in wells and in pools.

The long, broad basin country between the Zuñi mountains and the San Mateo is another grazing ground. In northwestern New Mexico cattle have but transitory, if any, hold south of the San Juan valley and east of the Navajo reserve, until we reach the Pueblo country southeast of the San Mateo mountains. The cattle of the San Juan valley were almost all moved thither from the crowded ranges of Colfax county in 1879 and 1880. Most of the Navajo cattle range westward into Arizona. Many migratory sheep of New Mexico profit on the superior grasses of Apache county in Arizona, driven west over the line for a few months, returning without official cognizance, and avoiding taxation.

SOUTHERN NEW MEXICO.

Southern New Mexico, except north of the thirty-fourth parallel, the western portion of Socorro county, is an elevated mountain district consisting of numerous short ranges and mesas. On the great plateau west of the 108th meridian herds and flocks graze to a limited extent. The sources of the Gila and Rio Mimbres are reported as grazing grounds, as yet unoccupied.

The eastern slope of the elevated region, to the Rio Grande from Socorro south, presents a series of grazing valleys.

In 1880 each head of neat cattle on the Rio Grande slope had an average of about 125 acres of forage, whilst the sheep of the same strip of country had an average of 30 acres. Socorro north of latitude 34° is a comparative plain. There is good grazing for 40 miles east from the Arizona boundary.

The other portions of the country north are generally arid. About one-third of the whole country in the west remained comparatively unoccupied in 1880. East of the Rio Grande to the well-timbered Oscuro mountains and southward there is good pasture for 15 miles north of fort McRae and also south of the fort.

In Grant county the stock occupation was only in the northern half in 1880. Below, about latitude 32° 25′ white and red marauders interfered with the holding of herds or flocks. Though water is scarce south of the Gila there is grass and the ranges are accessible. The pasturage is generally good on the Gila, the headwaters of the Rio Mimbres and southeast of the Burro mountains; sheep are twice as numerous as cattle. Below Socorro county and east of Grant county to the Pecos valley, except near the Rio Grande and the bases of the mountains, there are extensive tracts of poor grass lands, dry during three-quarters of the year. The most conspicuous vegetation is cactus. The brown, coarse scattered grass is unavailable until the rainy season may leave temporary pools of water.

In the fall of 1880, the immediate river valley of the Pecos, from latitude 34° 20′ down to 33° 30′, was nearly bare of vegetation. The basin of the river is about 30 miles wide at Fort Sumner. About 9,000 acres were irrigated and cultivated here when it was a military post, but the dam has fallen into ruin. At Bosque Grand, the grass on the first bottom was wholly eaten off, but upon the second bottom and over the foot-hills the pasturage at that time was very good and water was plentiful in springs which sank before they reached the river. Farther south we enter the most available cattle pasturage of Lincoln county, extending down the river to the Texas line and west on the branches of the Pecos. The plain of the Rio Hondo extends west nearly to Fort Stanton, averaging a width of 10 miles on each side of the river. Near the mouth of the Hondo two great springs supply water for irrigation. About South spring is an extensive ranch controlling a large number of neat stock and horses, now greatly reduced, principally by losses incident to that long desultory contest which is locally known as the Lincoln

county war—a border feud which, beginning with the depredations of desperadoes and Indians, extended to loss of life, the breaking up of herds, the practice of stock pillage as a business, and a series of forays and skirmishes involving the interests of hundred of miles of country before it was suppressed.

Twenty miles up the Hondo begins a cañon valley, 60 miles long and averaging half a mile wide. This is irrigated and cultivated in part, each settler also owning a small herd ranging upon the neighboring low mountains. Farther up the Rio Benito is the fort Stanton military reservation, an area of low grass-bearing hills.

Opposite to the intersection of the Hondo and the Pecos, a belt of rolling country, fit for grazing only, stretches eastward 40 miles to the Staked Plains. It is well grassed and watered by springs and pools.

Lincoln county, as bounded by territorial changes made in 1880, includes all of Doña Ana that lay immediately south of it, and contains about 29,687 square miles, or 19,000,000 acres, of which the extreme cattle occupation did not exceed 8,300,000 acres with its 20,700 head of neat stock and 75 per cent. of those situated north of 33° 12′, or the old south boundary of Lincoln. The 72,500 sheep ranging over about five-eighths of the county, or 11,875,000 acres, had an average of 164 acres of range per head. Ninety per cent. of that stock was west of the Pecos.

It is popularly reported that in 1840, while this was a Mexican province, there were driven across the present border into Mexico half a million of sheep, and one man is said to have disposed of flocks numbering 300,000. We are to remember that Santa Fé, settled about 1590–1600, had become a noted trading point.

The trade from the province consisted largely of sheep, principally for mutton, and piñon nuts. The exchange was in cattle, horses, iron, dye-woods, chocolate, and luxuries. The raising of sheep to supply demands beyond the borders of the province began probably before 1800. In 1839 Colonel Chavis, according to his son's authority, drove 75,000 sheep into Mexico from the Rio Grande valley, and in that year about 225,000 were moved southward by others. The stock then cost 50 cents per head in the province. The drives to Mexico, which are believed to have begun long before that date, continued until the gold excitement, and were then extended to California. Between 1850 and 1860 600,000 sheep are estimated to have been driven from New Mexico to California. In 1856 and 1857 those animals delivered brought sometimes $16 per head, but when the drives were largest $3 37 per head. After 1875 sheep were driven from California to New Mexico. Among the most notable of these drives from California was Colonel Stoneroad's drive of 10,000 in 1876 from Merced county to Puerta de Luna, 1,600 miles, occupying seven and one-half months by the route taken. Of the (approximately) 40,000 southern California sheep brought in by Stoneroad, Clancey, Robinson, Custer, Zuber, Booth, McKeller, and a few others from 1876 to 1879, about 13,000 went on to Colorado. They were all grade merinoes, a class until then very scarce in New Mexico. A shipment occurred in 1864 of 130 merinoes from Vermont into Colfax county, near the Tanaja. It is probable that cattle never had the same relative importance in New Mexico as sheep.

The extensive driving of neat stock from the south through New Mexico began in 1865. At that time a number of soldiers and about 10,000 Navajo Indians were at fort Stanton. To feed them, cattle were brought from Texas, but in number that exceeded the demand. Mr. Dawson conceiving that advantage might be taken of this in the Denver market went there and made contracts, and the cattle which had stopped near fort Stanton, and others brought direct from Texas, were moved northward, some to feed the miners and railroad men in Colorado, some as stock for Idaho and Montana. A year or two before the time that this through trade was inaugurated, the Indians east and northeast of the Llano Estacado were killing the western pioneer stockmen of Texas and stealing their herds. *Stockmen of New Mexico fitted out expeditions into the dangerous country and purchased the herds.* Many thousand cattle were thus secured for New Mexico, especially for its northeastern section. Their location, largely in Colfax county, constituted an important advance in New Mexican stock occupation. The Indian depredations on northwest Texas stock and almost simultaneously the close of the war of the rebellion enabled cattlemen to buy cheaply. The sudden and great opportunity to stock the northwest grazing country gave wonderful impetus to the through-driving business of New Mexico. The Texas men brought their droves to the lower Pecos, where they were purchased and thence driven by Goodnight, Dawson, Chisom, Stockton, and others. This trade reached its greatest magnitude in 1870. The Pecos route was the only one practicable through New Mexico for Texas cattle intended for Colorado and the northwest. East were the Llano Estacado and the Indians; west was the Rio Grande valley, interrupted sometimes by very dry areas, again by extreme ruggedness, and sometimes by farming districts.

DRIVES.

The Goodnight trail—often called the Goodnight-Chisom trail—was the route used by the first drives of western central Texas cattle to and through New Mexico. The cattle were assembled about fort Concho, from which point the drive went up the Concho river to its head, then southwest for 90 miles over the Staked Plains to Horsehead crossing, on the Pecos river, about 190 miles below Pope's well. That sandy waste, without water, constituted the most serious obstacle on the way. The time consumed in crossing was from 30 to 40 hours; beeves making it in the shorter time; a mixed herd requiring the longer time. Started about 2 p. m., the animals would, by the next afternoon, be frantic for drink, and the cowboys in advance would labor to hold them back, the stronger animals forcing themselves ahead, the exhausted ones feebly straggling far behind. A few miles north of the Pecos there is an alkali lake or pond into which the thirsty animals would plunge, unless prevented, and drink, causing death. The losses

were often very heavy. From Horsehead crossing the drive, keeping up the Pecos, entered New Mexico near Pope's well. There it divided, one branch striking west along the Delaware river for El Paso, on the Rio Grande, and thence on to Arizona, or, continuing farther north up the Pecos, it struck off at the mouth of the Penasco and proceeded west up that stream and across the divide to near Tulerosa, whence a general southwest course was made for Las Cruces, on the Rio Grande, the main Arizona trail through Florida pass. The great drive followed the Pecos nearly to the thirty-fifth parallel, thence crossing the divide to the Canadian river 20 miles above La Ceuta, then east of the Canadian, due north, entering Colorado either through the Trinchera pass or by northwesterly divergence through Clifton, across the Raton mountains.

The most experienced New Mexican authorities on cattle-driving put the present expenses (1880) of driving in this form: Ten to 12 men are required to 2,000 head of neat stock. The cost per head depends upon the size of the herd. Taking an average drive, say from Fort Worth, Texas, direct through the Panhandle to Vermejo, a drive of about 700 miles, it will require an expenditure of from $1,800 to $2,000 to bring through a herd of 1,000; to take 2,000 head will cost $3,000; to take 3,000 head, $3,500; 5,000 head, $5,000; 10,000 head, from $6,000 to $7,000. That is, whilst the small herd of 1,000 costs nearly $2 per head, the large herd of 10,000 costs not over 75 cents per head. A drive of the latter size is impracticable, however, unless a broad belt of pasturage is to be traversed, for that number in one drove is not easily managed, aside from the fact that the advance animals of this number in one body would leave nothing for the rear animals to feed on. A division into three or four droves over a width of country sufficient to feed each is necessary, keeping strong beeves, cows with calves, etc., distinct. A person who kept count of the cattle drive of 1874 from Texas reported that 110,000 head passed Roswell on their way up the Pecos. The same authority stated that to be the largest number that had ever gone through New Mexico from Texas in one season. Whether or no the number was exceeded during any year prior to 1874, it is certain that it has not been equaled since that date.

CATTLE.

The cattle of New Mexico have been:

1. So-called "wild cattle", which are not now found in the territory, but are frequently spoken of as having ranged the country in former years. They were brown, with a light stripe down the back; long, slim, blue horns; large and mealy nose.

2. So-called Texans, of Mexican origin, of every color, and with patches of white; horns enormously long and thin with a half twist back; heads coarse but thin; they are tall, gaunt, and narrow behind. The legs are long, and the hoofs large. The cow bred to a short-horn bull produces a wilder animal than those from Mexican cows, and one that does not breed as well.

3. Mexicans—so called in New Mexico—sometimes "Spanish" cattle; smaller than the Texans, raw-boned, with shorter horns, and not so wild. They are often black and white; sometimes their colors are brindle, brown, buckskin, and calico. In Taos county more than half this stock are black and white. The cow bred to a shorthorn bull produces an animal gentler than the Texan, but not so large or shapely. It is a harder blood than the Texan to breed out.

4. "Chino" or "curly-haired Texans"; large, well-formed, round; legs rather long; body heavy; color a brownish buffalo, no white, black, or red. In winter the hair is curly as a buffalo's; when it is shed in the spring the under coat has a bluish, glossy tinge. The horns are of medium size, and shaped as those of Missouri cattle. They are said to breed better than other Texans. Mr. E. Johnson, of Colfax county, had a number of this stock.

Storms and short forage affect the well-bred animal quicker than the coarse ranger. Many ranchmen consider that the two-year-old grade shorthorn cow crossed back to the Texas bull is the most profitable market animal. They assert that it is the favorite of Chicago dealers. Whether the common or high blood should predominate, depends upon the market to be reached. If the steer is to be fattened on the prairie, the purchaser seeks but little fineness in his animals; but a Missouri or Illinois buyer, who feeds with grain, wants the best-bred stock.

The management of cattle is best in the northeast and in the San Juan valley, and next on the Pecos. We shall refer chiefly to examples taken north of the thirty-third parallel in the eastern half of the state. Comparatively little land is owned, except on the grants; 160 acres are taken with water, under pre-emption or homestead law, for headquarters, where corrals, generally picket-built stockades, and the necessary houses are constructed, the walls of the dwelling consisting of posts set in the ground and filled between with adobe. A dirt roof on cross-pieces is covered with hay or brush. Log or frame houses are not unfrequently provided, but "dug-outs", half below and half above ground, are more common. The large majority of New Mexico cattle are run under "free range" and "line-riding"; fencing is fast increasing. "Close-herding" is the Mexican mode followed by native Mexicans, small owners, who, holding each from 75 to 150 head, guard them on foot, and corral them at night.

In fencing, three barbed wires on posts 33 feet apart cost $110 per mile, and if the posts are 25 feet apart, $125 per mile, within 50 miles of a railroad. But the fencing for cattle-grazing is not feasible for small areas; for example, two sections, 1,280 acres, which will carry 64 head at 20 acres pasture to the head, would require six miles of fence, costing from $660 to $750, or about 55 cents per acre, over $10 for each head of stock kept, whilst a township of 23,040 acres, to carry 1,152 cattle, would need but 24 miles of fence, and cost but about 12 cents per acre, less than $3 per head of stock kept. A fenced range must have, besides grass, water evenly distributed, and shelter.

The advantages claimed for fencing in this region are: 1st, the range is protected against overstocking by strange stock; 2d, the use of the bulls is restricted to the owner's herd; 3d, losses by straying and by theft are lessened; 4th, the cost of labor and of horse-flesh is reduced, because branding, beef-gathering, etc., may be made by a few regular cowboys; 5th, young and disabled animals may be helped and the stock assisted in severe weather; 6th, the special needs of either summer or winter range can be better provided for.

The objections to fencing are: 1st, for small herds, the expense; 2d, to fence public land is a risk not assuring to the investor the permanent use of the pasturage for his own herd alone, and, even if that may be allowed by courtesy, not continuing his tenure beyond the possible day of government sale or lease or the incoming of settlers taking up pre-emption or homestead tracts within his boundaries; 3d, in case of a severe storm or other cause of stampede, a charge of the excited animals, unless they are controlled by riders, will break the fence and injure themselves on the barbs.

According to answers received to special schedule questions in certain herds of New Mexican cattle (*a*) aggregating 98,929 in 1880, there were 1,010 bulls, or 1.02 per cent. of the whole; 33,672 cows, or 34.04 per cent.; 11,332 steers, three years and over, or 11.45 per cent.; 14,839 two-year-olds, or 15 per cent.; 16,189 yearlings, or 16.37 per cent.; 21,887 calves, or 22.12 per cent.

The estimated number of calves dropped to each 100 cows was 75; of these 65, as estimated, survived to yearlings. The estimated average annual loss for a term of years among these cattle over twelve months old was 6.5 per cent. The estimated percentage of annual loss in northern New Mexico from winter storms, theft, and other causes for a term of years among cattle over 12 months old is 6 per cent. In southern New Mexico the loss is 10 per cent., with a greater ratio from theft than in the north, less from winter storms, and a little higher from other causes.

AVERAGE VALUES AND LIVE-WEIGHTS OF NEW MEXICO CATTLE SOLD IN KANSAS CITY STOCK-YARDS DURING NOVEMBER, 1880.

Breed or class of cattle.	Number.	Average live weight.	Average gross receipts.	Estimated average age.
		Pounds.		*Years.*
Total	343	946	$24 62	3½
Texas (dry) cows grazed one or more seasons in New Mexico	67	766	16 88	5
Texas steers grazed one or more seasons in New Mexico	93	819	20 89	3½
American (native) beeves bred in New Mexico	183	1,078	29 00	3½

SHEEP.

Of the sheep in New Mexico, 72 per cent. may be estimated as Mexican sheep and the rest as of various grades of merino blood. The usual estimate in ordinary seasons is that 60 per cent. of the breeding ewes raise their lambs, which gives a yearly increase of about 38 per cent. on the flock. From February 5, 1879, to July 12, 1880, there was an almost unbroken drought throughout most of the territory, and sheep perished by thousands; and because of cold, dry storms, there was a failure of green grass at lambing time, and consequently the mother ewes failed in milk. The common estimate of consequent losses was nearer 50 than 25 per cent., including lambs. Rains came bountifully in the fall of 1880, relieving the extreme depression in which this investigation found the sheep interest in New Mexico.

The rams run with the ewes for about six weeks from the first or third week in November, depending upon the locality, whether in southern or northern New Mexico. Lambing is in April. The spring shearing is in May; immediately after which lambs are marked, docked, and castrated. Fall shearing increases the year's clip about 20 per cent., and permits an economical doctoring for scab, and is therefore advisabble where the climate permits. It has been general over New Mexico, but in northern localities of high altitudes the practice is decreasing.

The plant investment to run 5,000 sheep, including value of the stock, is put at $12,000. Five men are required throughout the year at a cost, including board, of $1,300 to $1,500; additional labor, during lambing and shearing, will increase the annual running expenses to about $1,800, or, including wool-tying, packing, and delivery in local market, we may put the total at $2,000. The usual estimate of yearly expense is from 40 to 50 cents per head.

Sheep are generally divided into flocks from 1,500 to 2,000 each, as is done in other grazing states, though the Mexicans sometimes herd as many as 10,000 in a flock, dividing them into four or five bands during the day only, and never separating the rams from the ewes. Among American flock-masters, the usual distinct flocks of wethers, mother ewes and lambs, rams, and otherwise, are maintained as occasions demand. Some sheepmen put their rams in with the ewes during the mating season at night only, and take them out in the morning, when they

a VALUATION FOR TAXATION.—In Colfax county cattle were valued for taxation at $9; sheep at $1 25; hogs at $4; and taxes were assessed at the rate of one per cent., one-half territorial, one-fourth county, and one-fourth school tax.

are fed with grain; others reverse this, to remove and feed at night; others again turn in half at night and half by day. With large flocks two men are assigned to each in careful management; one to herd and the other to keep camp, pack the donkeys—of which each band has two—move the tent, cook, etc.; or, if a double band, three shepherds are provided, two herdsmen and a cook. The pasture-ground is constantly changed, the tent seldom standing in one spot longer than twenty-four hours. Rations are carried for a grazing campaign of weeks; mutton-sheep are driven with each band to be slaughtered as required. Over all the forces an overseer is placed, who directs the movements and constantly rides the range to select grazing grounds and camps.

In the south and west, especially among the Mexicans and Indians, the grazing migration of sheep extends to great distances, even beyond the territory, to take advantage of all the pasturage facilities offered within a season's travel, and is often apparently directed to escape taxation. The pre-eminently nomadic sheepmen, who thus avail themselves of all ranges not actually occupied at the moment, are principally Mexicans. Their homes are where their sheep feed. This is one reason why not one-half the sheep of New Mexico are taxed. A county at one time is without a flock, whilst an adjoining county is crowded. Another month occupation is reversed. This peculiarity is more noticeable during summer, rain coming generally in local thunder-storms. The freshened districts, with their streams renewed and their sinks filled for a time, are quickly occupied. In the northeast, where Americans are located, pre-emption or homestead claims fix at least a home range, and the flocks are not so nomadic. This refers principally to Colfax, Mora, and San Miguel counties.

There is a strong feeling that the present land laws do not meet the needs of stockmen in this territory to enable them to control sufficient areas for profitable grazing. Wool is the principal object of sheep-raising in New Mexico; indeed it is only in the northeast that sheepmen raise mutton other than to supply the herdsmen with meat and satisfy a small local demand.

WAGES.—Wages vary from $12 per month and rations for the pastores to $30 per month for the mayordomo.

The number of wethers killed for meat will average 25 to an adult pastor or shepherd per annum, and some sheepmen are buying beef at 4 cents a pound to feed to their men that they may save their sheep for wool.

From the three northeastern counties about 60 per cent. of the sheep exported by drive went to and through Colorado and Kansas for slaughter, of which those to eastern Kansas and Nebraska were to be grain-fed and marketed during the latter part of the winter.

As the aim is simply to perfect an animal for wool production, the native Mexican sheep is bred to the merino ram. The first cross of these parents will double the Mexican yield and much improve the quality. As this grading is further continued, when a three-quarters to seven-eighths bred merino is produced, the improvement in size, symmetry of form, weight of fleece, and fineness of wool is offset by loss of hardiness and of fertility. Sheepmen report that when they cross with the large coarse-wooled mutton breeds the wool loses its uniform texture, and becomes uneven in strength, the fleece becomes too open, and exposes the animal to cold and wet, and finally the flocks do not herd well. The best wool-growers of northeastern New Mexico find that when they get (as they have reached in a few instances) an average clip of 8 pounds per annum of unwashed wool all around—wool fine, yolky, and of good medium staple—they accomplish about all that can be done without harm to a "rustling", hardy habit and prolific increase.

An average annual loss over a series of years in sheep from birth to weaning, owned by Americans, is estimated at 15 to 20 per cent.; in those owned by Mexicans from 25 to 30 per cent.; over six months of age the loss is estimated to be 10 per cent. of sheep owned by Americans, and 16 per cent. in sheep owned by Mexicans. In individual cases the losses in snow-storms have been very great. In 1880, a year of special calamity from drought, these figures were largely increased. Foot-rot and mouth disease are unknown in New Mexico, but scab is common. The majority of the Mexican sheep are not dipped. A dip consisting of 30 pounds of tobacco, 7 pounds of sulphur, and 3 pounds of concentrated lye, dissolved in 100 gallons of water, and used at a temperature of 120°, is deemed efficacious.

We have the following estimates of drives to the Pacific states from those engaged in the early driving: 1852, 40,000 head, selling at $12 to $16; 1853, 135,000 head, selling at $9 to $12; 1854, 27,000 head, selling at $3 to $4; 1855, 19,000 head, selling at $3 to $4; 1856, 200,000 head, selling at $3 to $4; 1857, 130,000 head, selling at $3 to $4; 1858, small number because of Indian troubles; 1859 the business ceased; aggregating 551,000 in the years specified.

In certain flocks of New Mexican sheep, aggregating 95,103 head, in 1880, there were 1,188 rams, 59,084 ewes, 20,715 wethers, 14,116 lambs (rams 1.25 per cent., ewes 62.13 per cent., wethers 21.78 per cent., lambs 14.84 per cent.). The estimated number of lambs dropped to each 100 ewes was 90. Of these 23.89 survived to yearlings.

According to special abstract No. 9, Manufactures, Tenth Census, the principal slaughtering establishments in New Mexico, during 1880, slaughtered 1,900 cattle, average live weight 910 pounds; 3,000 sheep, having an average live weight of 70 pounds; and 350 hogs, having an average live weight of 171 pounds.

APPROXIMATE VALUE OF SHEEP, AND WEIGHTS OF MUTTON SHEEP AND OF WOOL.

Breed of sheep.	Rams.	Ewes.	Wethers.	Lambs.	Mutton sheep, live weight.	ANNUAL SHEAR.			
						Rams.	Ewes.	Wethers.	Lambs one year old.
					Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Mexican	$2 50 to $3 00	$1 00 to $1 25	$1 00 to $1 25	$0 75 to $1 00	70 to 75	3 to 4	2 to 2.25	2.25 to 2.75	1 to 1.25
Half-breed Mexicans	4 50 to 6 00	1 50 to 2 25	1 50 to 2 00	1 00 to 1 50	85 to 90	6 to 7	3.25 to 3.5	4 to 5	2 to 2.5
California merinos	20 00 to 50 00	2 50 to 3 00	2 50 to 2 75	1 75 to 2 25	90 to 95	12 to 15	7 to 7.5	8.5 to 9.5	5.5 to 6

WEIGHT OF MUTTON.—According to a butcher's record in Santa Fé, Mexican fat wethers weighed, dressed, 35 to 40 pounds, whilst improved merinos weighed 50 to 55 pounds.

COMPOSITION OF FLOCK.—From record of an actual sale, March, 1880:

		Per cent.
Rams	205	2.16
Two years and upward, ewes	5,100	53.83
Two to four years, wethers	1,520	16.04
Dropped spring of 1879, lambs	2,650	27.97
Total	9,475	100.00

WOOL.—Bernalillo and Valencia counties rank first as wool counties, in regard of quantity; San Miguel comes next, and Colfax third; but in quality Colfax county is first, San Miguel second, and Bernalillo and Valencia third.

The wool of the Navajos is badly sheared, often clipped with a knife, and is badly prepared. One-half of their wool is made into blankets. About one-half of it is black, and it is heavier than white wool.

PELTS.—From books of sale consulted in Las Vegas, 198 pelts in March, 1880, weighed 711 pounds, and brought $156 42; average weight of pelts 3.6 pounds, and average price 79 cents. This was the best price known since 1870. Instead of this 22 cents per pound, the average price has ruled from 11 to 14 cents.

The drives of sheep from California into New Mexico, consequent to the drought on the Pacific coast, was large in 1876, 1877, and 1878, but fell off during 1879, and in 1880 numbered only about 10,000, for the latter was a prosperous year in California, and pasture had become poor in New Mexico. The direct cost of those drives is put at from 2 to 3 cents per head, but the loss on the way is often heavy. Of 25,000 sheep, the aggregate of three memorable drives made in 1876 and 1877, 8,500, or 34 per cent., perished on the way. While Mexican sheep will make from 10 to 12 miles per day on the route, merinos and other fine-wooled sheep will not travel more than 4 to 8 miles.

Individual statements were conflicting, but, as one said, most American sheep-owners do not succeed until they have a few years of experience. A prominent banker gave as his opinion that the failures were noticeably in the comparatively small holdings and with improved sheep. Of twenty-one great properties, representing 2,955,000 sheep, or an average of 140,700 head to each ownership, success was the rule. Four-fifths of those ownerships were vested in old Mexican families who inherited the pastoral traditions and conducted their administrations frugally, with the advantages of large plants and of herdsmen bred in their duties. Against this it is to be remembered that the losses of Mexican flocks exceed those of American flocks by 50 per cent.

SHEEP-RAISING ON SHARES.—Three methods are practiced in raising sheep on shares. By the first a flock of, say, 1,000 ewes and 30 rams is taken on five years' contract from the owner, the one who runs the flock engaging to return to the owner at the close of a fixed time, two or three years, 1,000 head of two years of age and 30 rams. Again, generally at the close of the contract, he is to return 1,000 adults more, three lambs being counted as an adult sheep. By the second method, called "partidario", a shepherd contractor, receiving, say, at the first 1,000 ewes and 30 rams, engages to return 200 wethers and 500 fleeces yearly until the close of five years, when he also returns the original number of the kind received. The third plan is this, illustrated by the following actual transaction: November, 1874, a herder received 4,000 ewes, 1,000 wethers, and 120 rams. In June or July of 1875, 1876, 1877, 1878, and 1879, each year, the owner received 10,000 pounds of clean, unwashed wool, delivered at the railroad, and in November, 1879, he had returned to him the original number of sheep, by classes, as the contractor had taken them.

ESTIMATED MOVEMENT OF CATTLE AND SHEEP DURING 1880.

FROM NEW MEXICO.			TO NEW MEXICO.		
Destination.	Cattle.	Sheep.	Source.	Cattle.	Sheep.
Arizona territory	15,000	30,000	From Arizona	1,000	10,000
Texas		15,000	From Colorado	5,000	
Wyoming (stock)		22,000	From Texas	4,000	
Colorado (mutton)		50,000	By railroad from states northeast, for breeding	150	500
Kansas		80,300			
Total	15,000	107,300	Total	10,150	10,500

CATTLE, SHEEP, AND SWINE IN NEW MEXICO TERRITORY AS REPORTED FOR CERTAIN YEARS.

Year.	Authority.	Cattle.	Sheep.*	Swine.
1850	Seventh Census (on farms)	92,977	377,271	7,314
1860	Eighth Census (on farms)	88,729	830,116	10,313
1870	Ninth Census (on farms)	57,534	619,438	11,267
1880	Tenth Census (on farms)	166,701	2,088,831	7,857
1880	Tenth Census (on farms, and estimated unenumerated ranch and range stock)	347,936	3,938,831	18,159

ESTIMATED CATTLE, SHEEP, AND SWINE IN NEW MEXICO TERRITORY JULY 1, 1880.

Sections.	Sections defined.	APPROXIMATE ACREAGE OF STOCK OCCUPATION.		STOCK.		
		Cattle.	Sheep.	Cattle.	Sheep.*	Swine.
	Total	36,890,000	60,500,000	347,936	3,938,831	18,159
Northern	North of northern boundaries of Socorro and Lincoln counties	23,150,000	33,700,000	280,722	3,660,149	14,550
Southern	South of the above	13,740,000	26,800,000	58,214	278,682	3,609

*See note to Texas tables, p. 31. Indian stock is included in above for convenience, embracing the whole Navajo reservation.

Total land area of territory	acres..	78,374,400
Total approximate area of available pasturage	do ...	63,374,400
Total approximate area of unoccupied available pasturage	do ...	12,874,400
Total population		119,565

AVERAGE DENSITY OF STOCK (CATTLE AND SHEEP) OCCUPATION.—Making one head of neat stock the unit of stock, and considering five sheep to equal one head of cattle in consumption of pasture, we have 1,135,702 units of stock, occupying 60,500,000 acres, or 53.27 acres to the head.

INDIAN TERRITORY.

CATTLE.

Indian territory is largely a grazing country. Cattle-raising is generally on the open-range system, without other food than that which nature provides on the ranges summer and winter. There are some exceptions to this in the northeast, on the Missouri and Arkansas borders, and at a very few other points in Paul's valley. Milch cows and saddle-horses require feeding during the winter. The stock is not herded, but the boundaries of the range are guarded by "line-riders".

The line-riders, two of whom share each of the camps about 20 miles one from another on the boundaries of the range, require from two to seven horses to the man. The line-rider starts out each morning in the direction of the next station and rides half way, where he should meet another rider. This chief work of the day is performed by noon. There is much more risk of cattle straying in winter than in summer. Short pasture, a fall of snow, or a cold blow will start them off to hunt for better range or to drift before the wind. From September more help is required, and the force must be doubled for the service until the early spring storms have passed and until the "round-up" is completed. The usual wages is from $20 to $25 per month, and board which is estimated at $10 per month. The cowboy furnishes his own bedding, saddle, bridle, and fire-arms.

EASTERN INDIAN TERRITORY.

The Indian meridian or sixth principal meridian of the United States land survey (97° 15′ 45″) is the one to which surveys in that region have reference. Dividing the territory by the Indian meridian southward to the Washita river, and thence down that river to the Texas boundary, sets off about equal areas east and west. The eastern section contained in July, 1880, 58 per cent. of the cattle of the territory, all the sheep but about 200, and over 99 per cent. of the swine. About 77 per cent. of the population is in the eastern half. The agricultural area

territory is northeast of the Arkansas river, principally near the borders of Kansas and Arkansas, and in the valleys of the principal streams. The seasons here vary irregularly from wet to extreme drought. The natural inclination of the Indian inhabitants is toward pastoral pursuits, and five-eighths of the country offers good permanent grazing. In the eastern portion of the Choctaw nation, east generally of the Kemishi river, according to J. F. McCurtain, principal chief, there is a timber-belt without grass. There is timber along the rivers, but seldom of sufficient density of growth to forbid stock occupation entirely. The best extended grazing in eastern Indian territory lies between the 35th and the 36th parallels of latitude. There, north of the north fork of the Canadian river, is an average of one head of stock to less than 40 acres of pasturage. North of the Cimarron and between the Canadian and its north fork is good grazing, but the Osages, Pawnees, Poncas, and Kaws about the 36th parallel, and the Seminoles and Pottowatomies occupying the region, have not many herds, whilst the Creeks are large stock-owners. Next in order as stock-raisers in this region are the Chickasaws and the Choctaws, south of the Canadian river, who hold about 40 per cent. of all the cattle in the eastern half of the territory and the same per cent. of the sheep. The leading sheep interest is, however, among the Cherokees in the northeast.

J. F. McCurtain, the Choctaw chief, reported that his nation had slaughtered for consumption during the year ending June 30, 1880, 3,250 head of cattle, and had sent out 6,500 at an average home value of $14. He estimated that beside their own stock, there were 6,000 head of cattle not belonging to the Indians, grazing there unlawfully. His figures for the growth of the cattle business in his nation were 25,000 held in 1845, 62,000 in 1860, 15,500 in 1870, 40,000 in 1875, and 65,000 in 1880.

WESTERN INDIAN TERRITORY.

In the western half of the territory, north of the north line of the Cheyenne and Arapahoe reservation, the grazing averages a medium pasturage with stretches of better quality along the river valleys, especially in the northeast and east. As a rule, it is better on the south borders of the rivers than on the north. The poorest pastures are on the divides and sand patches, the latter occurring just west of the 98th meridian, near the Kansas boundary and in the northwest, near the 100th meridian. Loco weed and gypsum water injure the ranges west of longtiude 98° 30′. The occupation in 1880 averaged, above the Cimarron river, one head of stock to between 40 and 60 acres of pasture with comparatively dense occupation near the Kansas boundary in the extreme west and very open occupation south of the Cimarron and in the southeast. None of the cattle are herded by Indians.

The government treaty engages to punish trespassing, on complaint of the Indians, by a fine of $1 per head of cattle and expulsion. The Indians have attempted, with but small success, to tax the intruders at the rate of 50 cents per year, or 5 cents per month on each head.

This belt of country is generally well watered, though much of the water is slightly alkaline. Twenty per cent. of the extent is rich valley, 73 per cent. rolling prairie, and 7 per cent. of timber—open-growing cottonwood, elm, hackberry, walnut, jack and post oak, grassed with wild rye, oats, blue-stem, and wild pea. The valleys possess excellent soil for agriculture and are covered with a close growth of blue-stem grass. The upland prairies grow sage-grass chiefly on their elevations, with buffalo and the mesquite grasses on the table-lands and in the hollows. The valley grasses are palatable and nutritious when young and green. The uplands provide the winter forage of plants that cure as they stand. In the herds permanently ranging here the original cows are from Texas. Shorthorn bulls have been used. Contact with the drive cattle coming through this section from Texas exposes the established herds to splenic fever, and stock from eastern states is most sensitive to contagion. The winter storms are severe here and are very destructive when accompanied by sleet, though the valley ravines and timber breaks afford considerable shelter. When snows lie on the ground the stock browse on shrubs, vines, and sage-brush.

The better herds are found near the northern boundary, with home ranches in Kansas.

The region drained by the Washita and the two Canadian rivers, in which is the Cheyenne and Arapahoe reservation, has good pasturage on its valley bottoms and on clayey soil underlaid with red sandstone or with gray limestone, particularly in the Canadian basins. Much of the growth is rich and dense. The streams tributary to the Cimarron and the Washita have precipitous banks, from which the red soil washes rapidly in gulleys. Over the eastern half of this region the uplands roll gently and the valleys are broad and smooth, but in the west the country is uneven, with abrupt hills and rugged depressions. Here, however, is the best winter pasturage. West of the 99th meridian there are, south of the Canadian, above 2,000 square miles designated for the grazing of cattle held by contractors for Indian supply. Otherwise, and indeed also south of the Cimarron, cattle are very scarce, and there are large tracts entirely ungrazed.

The chief grasses are blue-stem, sage, buffalo, mesquite, and black grama. Blue-stem is common along the north fork of the Canadian, east of the 98th longitude, but it, as well as the sage-grass, dies out between the 98th and the 99th meridians, and then come superior grasses. No cattle except those owned by members of the tribes or held by permission for Indian supplies are allowed in this region.

The Indian agent, to encourage the Indians to undertake stock-raising, several years ago established a small herd called the "mission herd". Wages earned by members of the tribe were set aside for investment in additions to

the herd, and the most active young men were set to herding them. The Indians thus learned to manage stock, and many of the mission-school boys acquired interests in the herd, which in five years came to number 1,574 head. In 1880 a distribution was made according to the share of each owner, and thus a number of stockmen were established with stock of their own.

Winter storms are less severe in this section than north of it, and the natural protection is much better. Just above the Cimarron river is a belt of from 1 to 4 miles wide of jack and post oak; that beginning east of the Indian meridian crosses the northeast corner to the Cimarron, and thence, just above the north boundary of the Cheyenne and Arapahoe reservation, continues westward nearly to the north fork of the Canadian river. The course of the "cross timber" has no apparent regard to water-courses or to any physical formation. A region in the southwest, embracing the Wichita reservation and the Kiowa Comanche and Apache reservation, beside "Greer county" southwest of the north fork of Red river, is watered by innumerable running creeks tributary to the Washita and Red rivers. The pasturage is good. The only exceptional feature to the general uniformity of evenly rolling plains inclining to the main rivers is the abrupt but low range of the Wichita mountains, rising but a few hundred feet above the general altitude of the center of the region. These mountains are about 10 miles wide and extend 30 miles in length. Various creeks of abundant and excellent water head in this cluster of mountains. The plains, stretching far on all sides from this center, promise agricultural capacity beyond their present excellent pasturage.

From the reservation of the Kiowas, Comanches, and Apaches, the military excludes all ranchmen not belonging thereto, except for special permits granted for supplies of milk, butter, etc., to the occupants of fort Sill. One thousand two hundred head of cattle were kept in the neighborhood of the military reservation in small herds by various ranchmen. The Wichita and the Caddo tribes owned nearly 4,000 head of cattle, and of that number about two-thirds were the property of white men who had taken Indian wives.

In all the western part of the territory there are large areas upon which no stock was pastured either permanently or temporarily in 1880, according to the best information obtainable. In the southwest corner of "Greer county", the possession of which is claimed by Texas, and where Texas ranchmen push in on good grazing unoccupied by Indians, each head of cattle has an estimated average range of about 70 acres of pasture.

The western part of the Chickasaw reservation, as divided by the Indian meridian and the Washita river, is a fine stock country with a unit of stock to but little over 41 acres. It is timbered upon the higher elevations and along the water-courses. Two belts of "cross timber" about 12 miles apart, of post and jack oak, run east and west through this region, but these belts furnish good forage, chiefly of blue-stem and wild rye, with occasional small areas of grama grass. The acorns of the post-oak fatten the pork of the Indians. The trees stand much scattered—about thirty to the acre. Outside of the cross timber there is a variety of excellent grasses. On almost any square rod one may find specimens of blue-stem, sage, buffalo, mesquit, and the grama, black and white. In the Creek valleys, where there is considerable shade, wild oats abound. The grasses named prevail over most of the country up to the Canadian river. A large proportion of the cattle in this section of the Chickasaw reservation is owned by white men who obtain their pasturage by making friends of influential Indians, to whom they make ostensible sale of their cattle and then hire themselves to care for the stock. This course evades the treaty law against trespassers, as the Indian has the right to hire white men. The share of the apparent Indian owner in the matter could not be learned. It is said that in the performance of the Indian bargains with the whites, as above described, not a single charge of bad faith has ever been made against the red man, though he has legal possession of the cattle and the probable owner could have no recourse to law.

The Indian council has unsuccessfully sought by taxation to prevent the cattle of outside parties from use of the pasture without recompense. Fully 4,000 Texas cattle were fattened here during the winter of 1879 and 1880, going in the spring and early summer to Caldwell and Hunnewell, and thence by railroad to market. This southern central region of Indian territory enjoys a comparatively favorable climate; beside which there is abundance both of shelter and of winter grasses. Along the Washita river, about midway of the reservation, there is an active, prosperous farming district known as Paul's valley. Here a comparatively large number of cattle and hogs are corn-fed.

The composition of certain herds in Indian territory in 1879, aggregating 65,000 head, as compiled from answers to circulars was: 1,300 bulls, or 2 per cent. of the whole; 21,450 cows, or 33 per cent.; 9,100 steers, three-year-old and over, or 14 per cent.; 11,060 two-year-olds, or 17.01 per cent.; 9,902 yearlings, or 15.23 per cent.; 12,188 calves, or 18.75 per cent. It was estimated that 75 calves were dropped per 100 cows; and that of these 57 survived to yearlings. The estimated average annual loss among cattle over twelve months old for a term of years was 5 per cent.

PUBLIC LANDS.

(Unorganized territory.)

In the adjustment of boundaries, in organizing states and territories, a strip has been left north of the Panhandle of Texas unassigned to any civil organization. It has been occupied to a greater or less extent in an indefinite manner since 1875. Its pasturage is good in quality and abundant, except through the northern half of the central third, where the arid character of southwest Kansas is continued and intensified. Its generally good

grazing in an untaxed and entirely free range, readily stocked from the south, and with the Kansas market near at hand for its beef, added to the exploring demand for new ranges, caused, in 1879 and 1880, the locating of several stockmen with permanent herds, and 58,450 cattle were found there at the time of this investigation. This does not include the temporary wanderings of Kansas stock. Above 20,000 cattle and 7,000 sheep frequently wander over the border from the Cimarron river ranges. Though it is in the belt of severe winter storms, there are enough timber and ravine breaks to give shelter. Since the statistics of 1880 were gathered almost all the available range in the region has been taken up, principally by one large stock company.

ESTIMATED CATTLE, SHEEP, AND SWINE IN INDIAN TERRITORY JULY 1, 1880.

Sections.	Sections defined.	APPROXIMATE ACREAGE OF STOCK OCCUPATION.		STOCK.		
		Cattle.	Sheep.	Cattle.	Sheep.*	Swine.
	Total	35,000,000		487,748	*55,000	773,931
Eastern	East of the Indian meridian and the Washita river, below the intersection of the meridian and the river.	17,441,600		308,500	*54,734	766,431
Western	West of above-defined division line	17,558,400		179,248	*266	7,500

* See note to Texas tables, p. 31.

Total land area of territory	acres	41,401,600
Total approximate area of available pasturage	do	38,000,000
Total area of unoccupied available pasturage	do	3,000,000

AVERAGE DENSITY OF STOCK (CATTLE AND SHEEP) OCCUPATION.—Making one head of neat stock the unit of stock, and considering five sheep to equal one head of cattle in relation to consumption of pasture, we have 498,748 units of stock, occupying 35,000,000 acres, or 70.18 acres to the head, according to the best estimates.

PUBLIC LANDS.

(Unorganized territory.)

Longitude, 100°–103°; latitude, 36° 30′ to 37°.

	Cattle.
Total stock on hand (estimated)	58,450

Total land area, 5,740 square miles, or 3,673,600 acres, of which over 3,000,000 are available, furnishing about 62.85 acres to the head of stock.

KANSAS.

HISTORY.

The beginning of stock-raising was by the bringing in of animals as army posts were established, and with the emigrant trains. The first herds ranged on the 38th and 39th parallels in western Kansas came from Colorado. In eastern Kansas small herds were brought by settlers along the Missouri and Kansas river valleys. As the stock increased the surplus found ready market with local butchers, new emigrants, and the freighters to Santa Fé and farther west. The early stock was good, being of eastern origin. As railroads superseded the ox-teams, the demand for working oxen declined, but about the same time Illinois began to require the cattle of Kansas to fatten on its grain, and Missouri made like purchases.

Within the twenty-seven counties unorganized in 1880, or, practically, west of the 100th meridian, a few daring men in 1871 put their herds along the Cimarron river and Crooked creek, in Seward and Meade counties, to compete with the droves of native buffalo and to maintain a defensive warfare against Indian and white cattle-thieves. Beside this initiatory occupation in the southwest, there was in the northeast some ranging done between Sappa and Prairie Dog creeks. Not until 1875 did the region attract general attention.

CATTLE.

WESTERN KANSAS.—Kansas is, in greater proportion than any other state or territory with which this inquiry has to deal (unless possibly California), a farming country, though west of a line drawn diagonally from the point where Beaver creek, a branch of the Republican river, intersects the Nebraska boundary—about longitude 100° 31′, to the point where Medicine Lodge creek, a branch of the Salt fork of the Arkansas river, intersects the Indian

territory boundary, about longitude 98° 30′—the state is thoroughly a grazing region. There is generally no large area west of that line where much corn is produced, while the annual rainfall, reaching 20 to 25 inches in the southeast quarter of this western ranch region, does not exceed 15 to 20 inches over the remaining three-fourths of the region. The two interests are therefore sharply and closely contrasted in Kansas.

If the state were divided by the county lines nearly corresponding with the 99th meridian, or along the east border of Phillips county at the north and Comanche county at the south, the three-fifths of the state east of that line will be the part generally adapted to farming. On the west of that line is pre-eminently a grazing country.

Buffalo-grass is pre-eminently the forage of western Kansas, not preferred in the early rainy season when the more succulent and perishable grasses abound. It ripens its seed by the time hot weather sets in, and then cures and is available through fall and winter. Grama is next in quantity and quality, with the same enduring character for winter pasturage. Blue-joint makes a fair showing north of the Smoky Hill river, in the comparatively well-watered section of western Kansas. South of the Arkansas river the sage grows extensively and forms summer feed. The noxious "loco" is found along the Cimarron river. Between the Colorado line and the 100th meridian Kansas is much more broken than the country either east or west of that area. The drifting of herds and flocks before the cold fierce storms in this treeless region causes much loss and labor. These winds would be irresistible if the surface of the country was an unbroken plain. Kansas rises westward from an average elevation of 800 feet on the Missouri boundary to about 2,000 feet on the 99th meridian; western Kansas has a still greater elevation. Where there is sufficient water, 10 acres of range will support a head of neat stock. When we find that there were in estimate 80 acres and a fraction of pasturage to each unit of stock, we have to remember that at least one-half of the occupied area is scantily watered and that the region is not fully stocked.

Looking at the figures for western Kansas it is also to be borne in mind, perhaps, that the best pasturage portion has been for years a trailway for drives, and that in 1880 it was crossed by about 225,000 head of cattle, grazing on the way. West of the 99th meridian, in the grazing region, comprising thirty-eight counties, of which eleven only were organized in 1880, we find areas more or less arid, especially in the southwestern corner of the state; to a less extent in Edwards and Pratt counties, in southern Kansas, just west of the 99th meridian, in the northern parts of Lane, Kearney, and Sequoyah counties, and in southern Greeley county on the west side of the state. In Clarke and Comanche counties, on the southern border of the state, extending west of the 99th meridian, and in the northwest counties of Kansas, water is plentiful.

About 6,000,000 acres, or 9,375 square miles of the aggregate unoccupied area of the state, lie in western Kansas, and, although largely accounted a desert twenty years ago, ranged over 184,000 cattle and 60,000 sheep in July, 1880. Later information shows that after the 1st of July a very great increase in stock occurred. The causes of this great and sudden increase of live stock have been alluded to in the Texas report; they were the terrible drought in Colorado and New Mexico and the unsatisfactory results of sheep husbandry in the Panhandle of Texas.

With very rare exceptions there is no fencing beside that of branding-corrals, and no hay cutting. In the unorganized counties there are no natural distinctions between summer range and winter range, which are determined only by the amount of pasturage and water; stock is not close herded, but the range is "line ridden"; a concerted "round up", in which all the ranchmen within extensive boundaries of common range join, begins about the 20th of April and continues until all calves are branded. Many shorthorn and some Hereford bulls are used. The marketing is principally in the fall, through October and November into December. South of the Arkansas the herds and their management are principally for breeding; north of the Arkansas, and especially north of the Kansas Pacific railroad, the business is generally that of grazing steers over winter or for a longer period, and then marketing them eastward for feeders or for slaughter in Kansas City and elsewhere.

The following is the composition of certain herds of western Kansas cattle, December 31, 1879, aggregating 21,000 head, as compiled from answers to circulars: 325 were bulls, or 1.55 per cent. of the whole; 6,720 cows, or 32 per cent.; 2,310 steers three-year-olds and over, or 11 per cent.; 3,500 two-year-olds, or 16.67 per cent.; 3,575 yearlings, or 17.02 per cent.; 4,570 calves, or 21.76 per cent. The estimated number of calves dropped per 100 cows was 76; of these 68 survived to yearlings. The estimated average annual loss among cattle over twelve months old for a term of years was 5.5 per cent.

EASTERN KANSAS.—In the cattle business of eastern Kansas there is a wide range of system as contrasted with that of the western, where we see the extensive grass-ranging, subject to some limitations, the cutting of grass for the winter, some fencing, more building and smaller herds. In the eastern tiers of counties the cattle are actually much more numerous, but they are raised in connection with farming chiefly to consume the grain. In the intermediate space between the 97th meridian and longitude 99° 30′ both grazing and feeding are practiced. Here, where wheat-growing is more prominent, and cattle-holding is but incidental to farming, the "herd law" is in force, as also in some other parts of the state in the counties of the southeast corner. This law frees the farmer from the necessity of fencing and holds the stockmen liable for injury done by the animals to the cultivated crops.

Eastern Kansas is now mainly a great corn region and feeds grass-grown stock from western Kansas for beef. Corn at 20 cents per bushel is made largely profitable in this way; at 30 cents the feeding of cattle requires closer management.

From the 97th meridian to about longitude 99° 30′, a little west of our assumed line between farming and grazing lands, wheat becomes relatively more prominent. The herd law prevails here, and corn is much less abundant than east of 97°, so that grazing is restricted and feeding is not practiced as in the eastern part of the state.

The prevailing and most highly esteemed grass in eastern Kansas is the blue-joint or blue-stem. It does not cure standing, but is a hay-grass. Though "buffalo" and the "grama" are found to some extent east of the 99th meridian, principally in the southwest corner of eastern Kansas below the Arkansas river, yet the buffalo grass is rapidly disappearing before increasing settlement, and there is no winter pasturage.

The feeder of eastern Kansas, who breeds a portion of his stock by crossing native cows with shorthorn bulls, purchases late in the summer from the western ranges three-year-old half-breeds, or thirty months' cattle if of better stock, weighing on an average 900 or 1,000 pounds. The better class of part-graded animals raised in eastern Kansas have had some corn. About the 1st of October feeding proper begins, the stock being held in open fields provided with sheds for shelter during storms. The feed consists of half a bushel of corn per day per head and 10 pounds of hay. The corn is usually fed in the ear, but sometimes shelled or crushed. With corn at 20 cents per bushel and hay $2 50 to $3 per ton, the feed costs about 11½ cents per day, or about $20 75 for the six months of average feeding time. Labor, interest, and taxes will somewhat increase the expense per head. Hogs follow the cattle, allowing usually one and a half hogs to a steer. The food of the hogs consists solely of what is wasted by the cattle and of the undigested grain that passes them. The pork made to each steer will net an average of $11. During feeding the steer will have put on 300 to 400 pounds, according to breed and kind.

In 1880 another system of feeding range or grass cattle was on trial. The stock coming fresh from the plains and entirely unaccustomed to other forage than the native grasses, requires several weeks in which to be brought to full feed on the new diet. The winter is well advanced before they reach a fattening condition. Beside this disadvantage, the spring market is at the season when the supplies of "native" cattle are the largest, and the western cattle come in competition with the fattened animals of older regions; consequently they sell low. Now the plan is to buy the "grassers" in the fall as before and "rough" them through the winter, acclimating them as it were, and letting them pick up corn which is left in the stalk fields. When spring comes they are put on full feed of corn, with the later addition of summer pasture, and then fattening quickly and making a better quality of beef, they reach the best market of the year. Kansas City, Saint Louis, and Chicago are the points of sale beyond the state.

Sheep-raising, as managed in the western part of the state, does not differ from its practice in the adjoining states of Colorado and Nebraska. As a rule, over all of eastern Kansas, and in the northeast corner of western Kansas, the feeding of corn during a portion of the winter is usual. With this grain so cheap throughout the easterly belt of the two states named, and many good meat markets within a range of practicable transportation, mutton becomes an object. Raising sheep with a regular provision for winter diminishes the per centum of loss from storms and increases the drop of lambs; and breeding to a greater extent for mutton than is required on the strictly pastoral grounds, preference is given to the long-wooled southdowns and cotswolds.

Kansas is now an important stock-distributing state, Dodge City and Caldwell and Hunnewell being the centers for the transfer and rearrangement of the great Texas northern drives, except of the numbers that go directly to Indian territory.

During the season of 1880 there was a very considerable trade in driving stock to Kansas and feeding sheep from Colorado, New Mexico, and the Panhandle of Texas. This arose from the severity of the drought in Colorado and New Mexico and the unsatisfactory condition of the industry in the Panhandle, together with an increased interest in sheep husbandry in Kansas. The causes were special, and this is not to be regarded as forming a permanent and regular traffic.

The following table shows the sheep driven into Kansas in 1880, with the average price. Of these 195,200, were for stock and 28,700 to feed for slaughtering; 25,200 were driven to Caldwell and 198,700 to Dodge City—a total of 223,900. From 70,000 to 80,000 remained in the then unorganized counties.

Source.	Number.	PRICE PER HEAD.	
		Feeders.	Stock.
Colorado	53,000	$2 37½	$2 12½
New Mexico	80,300	2 00	1 75
Panhandle, Texas	89,700	2 37	2 12½

The estimated average value of stock and mutton sheep in Kansas in 1880 was: Rams, $5 to $7; ewes, $1 50 to $2; improved, $2 25 to $2 75; wethers, $2 to $2 25; improved, $2 25 to $2 50; lambs, $1 to $1 50; improved, $1 50 to $1 75. The estimated average annual wool clip was: Rams, 6 pounds; improved rams, 7 to 9 pounds; ewes, 3½ pounds; improved ewes, 5 to 6 pounds; wethers, 4½ pounds; improved wethers, 6½ to 7½ pounds; lambs, 2 pounds; improved wethers, 3½ to 4 pounds.

In certain flocks of western Kansas sheep, aggregating 32,335 head in 1880, the composition was as follows, as compiled from answers to circulars: Rams, 310, or .96 per cent. of the whole; 15,450 ewes, or 47.78 per cent.; 8,900 wethers, or 27.52 per cent.; 7,675 lambs, or 23.74 per cent. The estimated number of lambs dropped per 100 ewes was 85; of these 49.68 survived to yearlings. The estimated average annual loss among sheep over twelve months old for a term of years was 8.5 per cent.

SWINE.

The large production of corn has developed hog-raising to great prominence in eastern Kansas. Western Kansas, lying west of about the 99th meridian, had on hand in July, 1880, an estimated total of only 41,366 swine, while eastern Kansas held 1,832,877 head. In 1870, according to the returns of the Ninth Census, the hogs on farms in Kansas were 206,587, and the enumeration of live-stock for 1860 found only 138,224 located on farms. The lack of accessible markets for pork was a drawback for a time, but packing-houses have been established in late years at various points. The people, chiefly settlers of small means, are less able to incur the expense of building proper shelter for stock, fencing off pastures, introducing pure breeds of swine, and of giving in other respects that outlay and attention to the business which it requires and receives in older communities. Lines of transportation are besides less frequently available, and freight rates on live animals are more onerous to the farmer than in regions of through railroad communication. As an important offset to these disadvantages the Kansas stock-owner can command Indian corn and pasture land at low prices.

There are two methods in vogue of growing hogs. By the first method the stock is reared and fed in close pens or dry lots, destitute of sheds, without green feed or sufficient fresh, running water. Reports by correspondents indicate that three-fourths of Kansas hogs are thus grown. The young hogs get a meager allowance of slop-feed, and are fed dry corn from weaning time till shipment to market. In breeding, the plan followed allows the sow and boar to be coupled at the age of six or eight months. The number served by a single boar varies from 35 to 75, according to the judgment of the owner. March and April in the spring, and August or early September in the fall, are the months for sows to farrow. The average number of pigs to survive weaning is a little over 5 per litter, or about 11 per annum in two litters, though some correspondents assert emphatically that an average of not over 4 pigs to a farrowing survive to be fattened. Soaking corn for sows with pigs during spring and summer is followed by some, crushing raw feed is less often practiced, but cooking grain or other hog food is not followed. This latter method, while it is admitted by many to be good on sanitary grounds, is not practiced for swine, since the expense incident to preparing the material offsets the possible benefits derived in a country furnishing cheap grain but where labor and fuel are costly items. When the plan of pasturing the sow and pigs is followed they run on grass from April till September, with sometimes a light allowance of slop-feed or soaked corn. In the case of the fall litters the use of a stubble field of wheat or rye stubble is given, accompanied by dry grain until the season for grass and full feed comes round in the following year. Of improved breeds the Berkshire and the Poland-China are preferred and rated about equal in desirable qualities.

During an average transportation of 150 miles the shrinkage was judged to be from 10 to 15 pounds per animal of fattened stock, and the mortality incident to carrying prime hogs the same distance was estimated at 1½ per cent. In the case of animals sold at 11 months old, which was the popular time for disposing of fat hogs, the average weight attained was given at from 200 to 225 live weight. With those hogs summered a second time on pasture, and full fed in the fall until twenty to twenty-four months of age, a much higher average was, of course, attained, the live weight reaching in such droves 450 to 525 pounds. The system introduced by the special breeders contemplates full feeding, use of green feed, and plenty of running water while growing. But little clover or blue grass is grown for the use of hogs within the state, the only pasturage being furnished by the uncultivated grasses, with the added access to the stubble-fields after harvest. In many counties half-grown porkers follow beef-cattle that are feeding on corn.

In spite of apparent exceptional freedom from continued epidemic disease, when contagion or infection has appeared, the careless management incident to a new state has exposed the industry to severe checks. Only one correspondent, a feeder in Cowley county, claims to have experienced total immunity from loss, no complaint ever having prevailed in that part of the state. Throughout all other counties heard from an occurrence of lung trouble, thumps, sore mouth, or cholera has made havoc at one time or another. In 1880 the state, from the report of a large number of farmers, was remarkably free from the presence of any fatal epidemic.

The state board of agriculture reports each year the live stock of the agricultural portion of the state, which comprises about three-fifths of the area. This greatly facilitates the acquirement of knowledge regarding the resources of the state.

AVERAGE WEIGHTS OF 11,796 KANSAS GRASS-FED BEEVES SOLD IN CHICAGO AND KANSAS CITY DURING NOVEMBER, 1880.

Kind of cattle.	Where sold.	Number sold.	Average age.	Average live weight.
			Years.	*Pounds.*
Kansas-Texans	Union stock yards, Chicago	2,212	4½	926
Kansas-Texans	Union stock yards, Kansas City	2,361	4	884
Kansas half-breed	Union stock yards, Chicago	1,034	3½	1,032
Kansas half-breed	Union stock yards, Kansas City	245	3½	954
Kansas natives	Union stock yards, Chicago	1,762	3½	1,142
Kansas natives	Union stock yards, Kansas City	2,620	3½	1,086
Kansas natives in part (grade shorthorns)	Union stock yards, Chicago	662	4½	1,354

According to Special Abstract No. 9, Manufactures, Tenth Census, the average live weight of 11,958 grass-fed Kansas beeves slaughtered by the principal slaughtering establishments in the state was 1,004 pounds, and the average age 3⅘ years, and of 23,754 other Kansas grass-fed beeves the average age was 3⅘ years and the average weight 1,014 pounds.

MOVEMENT OF STOCK.

It is estimated that there were brought into Kansas in 1880 154,038 cattle and 275,000 sheep, as follows: From Texas were brought 123,038 cattle, of which 58,000 were sold for stock purposes and 24,831 for beef purposes in Indian territory, and 40,207 for stocking Kansas ranges; from Colorado 30,000 head. One thousand bulls were brought into the state for improving stock. From the Panhandle of Texas 89,700 sheep were brought; from New Mexico 89,300, and from Colorado 103,000; beside 2,000 rams for improving stock. The above statements have reference only to that part of Kansas lying west of longitude 99°.

CATTLE, SHEEP, AND SWINE, IN KANSAS AS REPORTED FOR CERTAIN YEARS.

Year.	Authority.	Cattle.	Sheep.*	Swine.
1860	Eighth Census (on farms)	93,455	17,569	138,224
1870	Ninth Census (on farms)	373,007	109,088	206,587
1875	State agricultural report	703,323	106,224	202,658
1876	do	700,624	143,062	330,355
1879	do	976,463	311,862	1,264,490
1880	do	1,115,312	426,492	1,281,630
1880	Tenth Census (on farms)	1,451,057	409,071	1,787,960
1880	Tenth Census (on farms and estimated unenumerated ranch and range stock)	1,533,133	629,071	1,874,243

ESTIMATED CATTLE, SHEEP, AND SWINE IN KANSAS JULY 1, 1880.

Sections.	Sections defined.	APPROXIMATE ACREAGE OF STOCK OCCUPATION.	STOCK.		
		Cattle and sheep.	Cattle.	Sheep.*	Swine.
	Total	45,282,880	1,533,133	629,071	1,874,243
Eastern	East of about ninety-ninth meridian	29,500,000	1,348,547	572,893	1,832,877
Western	West of about ninety-ninth meridian:				
	Organized counties (11)	6,266,880	45,636	30,080	26,366
	Unorganized counties (27)	9,516,000	138,950	26,798	15,000

* See note to Texas tables, p. 31. Indian stock is included in above.

Total land area of state	acres..	52,288,000
Total approximate area of available pasturage	do ..	50,000,000
Total approximate area of unoccupied available pasturage	do ..	4,717,120
Total population		996,096

AVERAGE DENSITY OF STOCK (CATTLE AND SHEEP) OCCUPATION.—Making one head of neat stock, the unit of stock and considering five sheep to equal one head of cattle in relation to consumption of pasture, we have 1,659,067 units of stock occupying 45,282,880 acres, or 27.29 acres to the head, according to the best estimates.

COLORADO.

PASTURAGE.

In describing the stock-raising capabilities of Colorado the reports of the United States Geological and Geographic surveys have been used as a basis, modified and extended by special investigation. Mr. Henry Gannett (*a*) makes the following estimated distribution of Colorado lands: 7,323 square miles, or 4,686,720 acres tillable land irrigable without employment of reservoirs; 55,000 square miles, or 35,200,000 acres pasture land of all qualities; 20,000 square miles, or 12,800,000 acres spruce and pine timber; 13,500 square miles, or 8,640,000 acres quaking aspens, piñon pine, and scrubby cedar; 6,565 square miles, or 4,201,600 acres, barren, worthless.

To exhibit approximately the number of acres in Colorado in 1880 on which live-stock can be raised, the tillable, agricultural land is put at 7,500 square miles; wild open pasture (mostly plains), 55,000 square miles; quantity of grazing land in forests, 8,500 square miles, or a little over 25 per cent. of the area included in Mr. Gannett's two items of timber; making a total of 71,000 square miles (45,440,000 acres) of pasturage available either in summer or in winter, sometimes through both seasons, and 32,645 square miles (20,892,800 acres) worthless for the purpose of stock-raising. In attempting an approximate representation of the different qualities of pasturage the distinctions are necessarily more or less arbitrary. All areas counted by the scientific surveys as agricultural lands are here included in the good pasture; also other lands within ten miles of running water; and whatever other pasturage replies to circulars and personal examination pronounced "good", even though in 1880 many of those sections were overstocked or badly eaten down by previous occupation. In fact, after more than a year of extreme drought, the Colorado pastures were as a rule in bad condition in 1880. The best quality of pasture of to-day is only comparatively good, the best quality of twenty years ago having been essentially changed. There is hope that with more care, with new methods of irrigation, with less overstocking, etc., depreciation may not continue.

Of the 31,000,000 acres and over of different qualities of pasturage in eastern Colorado, we may class 12,000,000 to 14,000,000 as from fair to good—perhaps not more than one-fifth of that as strictly good—and from 16,000,000 to 18,000,000 as poor, exclusive of 1,000,000 acres worthless or nearly so. In western Colorado, greater in area than eastern Colorado, we find but about 14,000,000 acres of pasturage, but there were over 2,500,000 acres unused in 1880, mainly in the Indian reservations. This includes some of the best pasture in the state, some of it virgin grazing, though in small scattered tracts, often suitable only for summer occupancy. As a rule, that which is suitable for occupancy during a portion only of the year naturally retains its excellence longer than a continuous pasture.

The absence of summer rains is the preservation of the winter forage with the peculiar vegetation of the western grazing regions. The bunch-grasses particularly, that keep their sweetness and nourishment all winter, standing where they grow, would become worthless in a climate where summer and autumn rains fall.

The natural seeding of the grazing regions is trampled in by stock, especially by sheep, and in soils not too sandy is thus defended from the drying and freezing it would otherwise suffer. This and the richness of sheep manure, with its better distribution, not smothering the grass where it is dropped, are to be considered against the close herding and cropping of the same stock, which latter practice does undoubtedly tear out grasses by the roots from light ranges. Mr. Abner Loomis, of Fort Collins, who has had twenty years' experience in Colorado, testified strongly to the luxuriance of the native grasses with moisture and of their wonderful recuperative powers after extreme cropping and prolonged droughts.

Among the principal grazing-grounds of the state we may first name the plains just east of the mountains, of which the favorable portions are from the mountains eastward, generally to the 104th meridian, the Platte river neighborhood, and the more extensive regions of the Arkansas river. Along the eastern borders of the state are tracts of arid though not entirely barren land. These dry regions do not absolutely forbid winter occupation, except in a few limited areas. The winter snows, where drifted, supply moisture under the warm breath of stock, or are melted in holes that animals have tramped or wallowed. Stock will travel farther for water without discomfort in cold weather. Thus, in winter grazing, animals generally will double the length of their daily summer range from water, and water will often be found in winter on plains absolutely dry in summer.

Weld and Elbert counties held in 1880 a fraction over 37 per cent. of all the cattle in eastern Colorado, and the densest occupation of the same stock was in Boulder and Elbert counties. The cattle occupation was least in southern Jefferson and eastern Douglas counties.

Most of the sheep of Colorado are found between the 104th and 106th meridians, and 67 per cent. of the sheep in eastern Colorado were in 1880 between the mountains and the 104th meridian. Boulder county made no return of sheep, and towards the Wyoming and the Kansas border we find large areas without sheep. El Paso, Huerfano, Larimer, and western Elbert counties had something over 42 per cent. of all the sheep in eastern Colorado and over 37 per cent. of the total number in the state. El Paso and Huerfano counties graze 293,000 sheep on about

a United States Geological Survey.

2,500,000 acres of available pasture, about 8 or 9 acres to the head. It is well here to remember that this represents the situation in Colorado after the extreme drought of 1879, prolonged until late in the spring of 1880, during which time the drop of lambs was smaller, there was an increase of the death rate, and large drives were made from the state.

Within the mountains of western Colorado, in the north, we notice first North park. The pasturage was but sparsely occupied, even by summer herds, before 1878. The general impression had been that stock could not winter there because the temperature from 500 to 600 feet above the Laramie plains was too severe and that its basin would hold deep snow. During the winter of 1879 some men from Laramie plains kept their stock in the park with success. The abundance of good grass gave the cattle a reserve of strength with which to meet temporary privation, and the central open ranges of the park were well swept of the excessively dry snow. There were natural shelters, giving protection from the coldest storms. Mr. Gannett estimates that the park contained 700 square miles of fine grazing lands, but, adding wood openings and other extensions of the park range proper, there are probably nearly 1,000 square miles of grazing of different qualities. Middle park is in the south of the same county (Grand). Its pasturage lies more in detached portions than that of North park, and is at least 1,000 feet more elevated. For those reasons, and because less accessible than other ranges north and south, it was but very lightly grazed in 1880, and had not been tried, so far as could be learned, for winter occupancy by cattle. Its grasses are luxuriant. The extreme occupation of Grand county was not 200 square miles.

Passing southward, the next important grazing range is that of South park, in Park county, lying about the sources of the South Platte. It contains a pasturage area not less than that of North park, and in every respect exceeds in value any equal area occupied as a grazing region in Colorado up to 1880. It then held about 30,000 cattle and 5,000 sheep. Among its advantages is shelter on the foot-hills and in the mountain nooks. The surrounding mountains form natural barriers against straying; the lay of its basin or main inclosure is so situated as to be swept of snow; there is pure running water in abundance, and several warm springs are open through the coldest winters; also a variety of grasses suited both for hay and for standing winter forage. The many mining camps within easy drive of its ranges furnish markets for all its meat product. The risk of an exceptionally severe winter is the chief drawback.

Following south, we come, below the Arkansas river and between the Wet mountains and the Sangre de Christo range, to Wet Mountain valley and Huerfano park, the former range lying in Fremont and Custer counties, the latter about the forks of the Huerfano river, in Huerfano county. The two ranges contain pasture equal to about five-eighths the area of the South park grazing. The Wet Mountain range lies in the two counties that showed in 1880 the densest cattle occupation of western Colorado. Although an old pasture, and available through both summer and winter, it still has a fair quality of grazing. It extends well into the mountains, and has been, at times, apparently eaten out. So, too, of Huerfano county, in the eastern portion of the state. The San Luis valley is the largest continuous range in western Colorado. It stretches from the upper waters of San Luis creek, where Homan's park is situated, or about latitude 38° 20′, into New Mexico, and comprises, in Colorado, one-fourth of Saguache county, one-half of Costilla, one-fifth of Rio Grande, and about one-fifth of Conejos county. There are all varieties of pasture, from limited valley and mountain patches of excellent quality, principally in the north, to arid sage tracts and alkali sands in southern Costilla. With an average elevation of about 7,750 feet the climate is favorable for winter grazing. The mountains form barriers on three sides, with but two passes, Poncho on the north and Moscha on the east. The herds of San Luis valley rarely drift beyond its natural confines, and the labor of "round-up" is slight. The whole of this region was reported by stockmen to have carried 50,000 cattle in 1879, but a less number was assessed. In June, 1880, its neat stock was estimated to be between 46,000 and 47,000, of which 75 per cent. were north of latitute 37° 45′. The sheep of the four counties traversed by the San Luis valley are twice as numerous as the cattle, but they occupy chiefly the regions above the valley, east and west of it, and east of the Rio Grande south of Fort Garland. In the upper portions of San Luis valley the ordinary bunch-grasses prevail.

In the middle region, down to the Trinchera, and particularly west of the Rio Grande, the grama grass prevails. Farther south salt grasses and sage form the grazing. Through the mountain borders and moist valleys blue-grass, wild oats, timothy, and clover are found. Along the foot of mountain walls on the east side of the valley the sand drifts in hills. Southeast of Meadow creek and from the San Luis lakes to the western flanks of the Sierra Blanca there is a wide sweep of sand-dunes, ending in alkali swamps or ponds in the southwest, where greasewood prevails for 8 or 10 miles. North of the lakes San Luis creek is not running water, but rather a broad bog of alkali mud, in which cattle sometimes perish from miring. The upper waters of the streams running westward from the Sangre de Christo range have cut deep cañons, encumbered with timber rubbish. We may call the pasturage of the upper one-third of San Luis valley "good" on an average. Most of the central portion on the eastern slope of the Lacarita and the Del Norte mountains, following the Rio Grande out into the plains of the valley, may be classed from good to poor. The average pasture below the latitude of Fort Garland is poor.

Northwest of Homan's park, or the beginning of San Luis valley, and in Gunnison county, there is a range on both sides of the Gunnison river up to the mouth of Tomichi creek. It continues along the valleys of the Gunnison and East rivers, and along Tomichi and Ohio creeks. Mr. Gannett found it in 1878 an excellent summer range untouched, and adjacent winter pasture existed in the lower valleys. Most of that pasturage lies within the Ute reservation.

Farther west is the Uncompahgre valley, with a limited amount of good grazing. In Uncompahgre park, of about 3,000 to 3,500 acres, it is of good quality, but generally the table land of the Grande and Gunnison rivers

is illy suited for herds. The rivers often run in deep cañons and the pasturage patches are broken by outcropping rocks or sprinkled with shale. Between the Uncompahgre river and the Dolores river is the extensive elevation called Uncompahgre plateau, comprising about 2,500 square miles. A large proportion of this is said to have admirable pasturage of coarse, strong grasses that preserve well for winter. It is supposed, though not tried, that cattle cannot survive the winters there. All accounts of Gunnison county southwest of the Grande and Gunnison rivers are indefinite in regard to pasturage capacities. The disconnected pasture areas forbid the compacting of large herds, and it is remote from the highways and markets.

Of the country northeast of Gunnison river and south of Grande river, up to Middle park, Mr. Gannett says: (*a*)

> We find pasture land of an indifferent quality, grading here and there into excellent grazing land on the plateaus at the foot of the park, about the courses of the Grand Eagle and the lower course of Roaring Fork. The great valley of the Grande, at the mouths of North Man and Rifle creeks is very poor in grass, and does not improve farther down, where it is narrowed between the North Man plateau and the Roan cliffs. The broad valley of Plateau creek and the northern slopes of the Grand Mesa are fair grazing land.

Roan or Book plateau, in southwest Summit county, is well grassed where it is not too rugged, cut up by cañons with deep stream-beds frequently dry, and, where wet, difficult to reach. In the north, west of the 108th meridian on the descents to White river, the irregular grazing tracts are well grassed. They are less rugged and better watered south of White river than Roan or Book plateau. Pi-ce-ance and Douglas creeks furnish running water at all seasons. North of the White river east of the mouth of Deep Channel creek and extending over the Danforth to the confluence of Good Spring and Milk creeks there is much good grazing, believed to be safe through the winter. West of Deep Channel creek, north of White river, toward Yampa plateau, the rugged plains are nearly arid and barren.

The average pasture character of what remains of Summit county is good, particularly north of the 40th parallel. There are rugged elevations, pieces of heavy timber, and poor dry patches, that prevent large areas of continuous pasturage, but there are more frequently luxuriant park and meadow spots. Elsewhere are greater tracts of strong, coarse, self-curing grasses, with probable safety for herds in winter. Gunnison county held but 4,500 cattle and 5,000 sheep in 1880, mostly owned by Indians. Summit county was totally unoccupied, except perhaps temporarily by drifting from southeast Routt county. The mining population of this region will probably consume what beef it may produce in the future.

Routt county, south of the Yampa, west of the 108th meridian, is almost desert, a sage and stunted pine region, and is a continuation of the arid region in Summit county. North of the Yampa and west of Little Snake river there are a few cattle that have come in from Wyoming, from the pastures of which this differs in greater elevation and more rugged topography. It is better watered than the Washakie basin and the grasses grow thicker on a heavier soil. Brown's park, in the northwest corner on Green river, before it runs into Lodore cañon, was known years ago as a wintering ground. There are widenings of the valleys of the Yampa and the Little Snake better than those of Brown's park because heretofore less grazed. East of the Little Snake and north of the Yampa, to the heights of Elk Head mountain and the Park range, is a high rolling region of generally very fair grazing. It becomes excellent in the bend of the Yampa for 20 miles east and west of the point where Good Spring creek enters it from the south. On the sloping bases of the mountains, which are but little timbered, the pasturage is also good. On the dry, exposed plateau between Godiva ridge and the Elk Head mountains the grazing is poor; no stock was in this part of Routt county in 1880, except about the north bend of the Little Snake, where it strikes the boundary line between Wyoming and Colorado, and on Saint Vrain's fork. Occupation of the county, except west of the Little Snake, was very slight and variable. Above the mouth of Elk Head creek stock occupancy extended, irregularly and but transiently, up the Yampa to Egeria park, and thence over into Middle park. In all of Routt county there were in the census year but 7,700 cattle and no sheep, or about one animal to each 500 acres.

Wheeler and Hayden's surveys contribute most that is known regarding the extreme southwest beyond the San Juan mountains. About the San Miguel mountains, north and west, with the exception of limited tracts in Gypsum and Saucer valley, the grazing is very poor and water scarce, sage, piñon, and a little grass composing the vegetation. Southwest of the La Plata mountains, to the neighborhood of the San Juan river, in the very corner of the state, below the pine forests, the proportion of pasturage land is small, but water is not so scarce as farther north. Grama grass and white sage constitute the principal forage plants; the sage occupying the dry places and open plains, the grama growing on the mountain slopes. South and southeast of the La Plata mountains, as far east as the spur of the San Juan mountains, on the plateau belt midway between the New Mexico boundary and the elevated mountain ranges and east of the Rio Piedra, there are many pieces of fine pasturage, furnishing approximately in the strip of country specified 250,000 acres. They occupy most of the southeast corner of Conejos county, on the Rio Nutrea, Rio Blanco, and the headwaters of the San Juan.

CATTLE.

The conduct of cattle-raising is very similar in Colorado, Wyoming, and western Nebraska, but the cattle interest of Colorado has been very much modified in late years by dry seasons, the markets, and the introduction of sheep. The statistics of 1880 were affected by the disastrous drought of 1879 and 1880. Not only were the

a United States Geological Survey Report, 1876.

dried-out pastures overfed in 1879 and little old grass left for winter subsistence but the continuance of drought until midsummer of 1880 without snow enough for moisture or cover during winter prevented the starting of spring grass. In some parts the general spring "round-ups" were omitted until after the rains began, the herds having scattered in every direction, the stock being too poor to handle, and the difficulty being great to gather or move them where there was neither water nor grass. Stockmen did not know what cattle they possessed until later in the season. Animals had completely deserted some of the ranges on the plains and crowded into other ranges, especially those of the mountains or wherever there was water. Under such circumstances and the disheartened condition of ranchmen definite statistics of 1880 were hard to get and could only be computed after midsummer when owners were able to make approximate statements to be compared with the assessment returns. About 150,000 stock-cattle were driven out of Colorado during 1880 because of the drought. Another result was that a large proportion of the three and four year old steers that should have made beef in that year had to be carried over to 1881, to attain condition, while outside cattle were brought into Colorado cities to furnish beef, for which more than half those driven in were used.

Spaying has been practiced in some herds. The operation was performed on young heifers, and the spayed cows in their fourth year were marketed at the same price as steers. In certain cases reported, where nearly 2,000 animals were spayed for special sales, the losses were insignificant and the result was entirely satisfactory.

The increase of calves for 1880 was, of course, affected by the disastrous season. While the calves constituted something over 20 per cent. of the total number of cattle in 1879, in 1880 there were not more than 18 per cent. The increase of the cattle interest between 1870 and 1880, as exhibited by a comparison of the numbers of cattle on farms, as reported by the Ninth and the Tenth Census, is 390⅛ per cent. As this special investigation of the statistics of all cattle, both on farms and ranches, is the first attempt to include cattle on the grazing areas, no comparison can be instituted except with the assumption that the proportion between farm cattle and all cattle was the same in 1870 and in 1880.

At this writing we know of the great loss of cattle during the winter of 1880–'81, but we learn also that the spring and early summer of 1881 produced superior pasture. This, with the reduction of stock during the census year, greatly improved the quality of stock. Their fine condition and the rise in value caused large sales of beeves for home and eastern markets. Beside this draught on the number of cattle, the natural increase of calves is reported to be reduced by the hardships of winter as much as in 1880.

The composition of certain herds of Colorado cattle owned December 31, 1879, aggregating 124,576 head, as compiled from answers to circulars, was as follows: Bulls, 2,118, or 1.7 per cent. of the whole; cows, 42,336, or 34 per cent.; three-year-old beeves, 12,087, or 9.7 per cent.; two-year-olds, 22,429, or 18 per cent.; yearlings, 19,937, or 16 per cent.; calves, 25,669, or 20.6 per cent.

AVERAGE WEIGHT OF 14,440 GRASS-FED COLORADO CATTLE SOLD IN CHICAGO AND IN KANSAS CITY, NOVEMBER, 1880.

Kind of cattle.	Where sold.	Number.	Average age.	Average live weight.
			Years.	*Pounds.*
Colorado-Texans, wintered one or more seasons on Colorado ranges	Chicago	1,592	3½	880
Colorado-Texans, wintered one or more seasons on Colorado ranges	do	345	4½	956
Colorado-Texans, wintered one or more seasons on Colorado ranges	Kansas City	1,794	4½	940
Colorado half-breeds	Chicago	2,878	3½	1,007
Colorado half-breeds	Kansas City	6,398	3½	934
Colorado natives	Chicago	106	4½	1,258
Colorado natives	Kansas City	1,327	3	963

AVERAGE VALUE OF CATTLE ON THE RANGE IN COLORADO.

Kind of cattle.	Bulls.	Cows.	Beeves.	Three-year-old steers.	Two-year-old steers.	Two-year-old heifers.	Yearling steers.	Yearling heifers.	Calves.
Texan, from the trail	(*)	$12 00 to 12 50	$10 00 to 20 00	$16 00 to 17 50	$12 00 to 12 50	$11 00 to 12 00	$8 50 to $9 00	$7 50 to $8 00	(*)
Texan, acclimated.†	(*)	14 50 to 15 50	23 00 to 24 00	19 00 to 20 00	15 00 to 16 50	14 00 to 15 00	.....	.....	(*)
American (native)...	$35 00	17 50 to 18 50	28 00 to 30 00	24 00 to 26 00	19 00 to 20 00	17 50 to 18 50	13 50 to 14 50	12 50 to 13 50	$8 00 to $9 00
American, graded by improved bulls.	$50 00 to 75 00	20 00 to 21 00	32 00 to 34 00	27 00 to 29 00	22 00 to 23 00	19 00 to 20 00	15 00 to 16 00	14 00 to 15 00	9 00 to 10 00

* Texas cattle of these classes are seldom turned loose from the trail on Colorado ranges. † Only a few thousand Texan cattle were driven into Colorado in 1880.

SHEEP.

California and Colorado practice a similar conduct of sheep-raising. Colorado has for years received the overflow of improved stock from California. It is well here to refer to New Mexico in connection with Colorado, because, while there are important differences of quality of stock and management of flocks between the two, the joint area represents a unity of grazing location, climate, topography, pasturage distribution, and forage characteristics. The southern third of Colorado in stock-raising practically belongs with New Mexico. Opportunities were

peculiarly favorable on the field for study of the sheep interests, especially in New Mexico. In both Colorado and New Mexico the most important owners responded most courteously to the census inquiries.

Before 1865, extending back to 1850, the only sheep-raising in Colorado was by Mexicans on the southern streams near the boundary of New Mexico. It was simply an ownership, not a husbandry; the hardy, long-legged, long-wooled, fair-sized native or Mexican sheep were left almost entirely to "rustle" for existence, and they yielded a clip of from 1½ to 2¾ pounds of wool. About 1864–'66 a few Americans started flocks with the native Mexican ewes which were bred with rams from the east. In the first-named year a Mr. Toppan brought in a flock from Missouri. The first Colorado natives were further improved by the introduction about 1872–'73 of merinos. Since that time the better California stock and merinos from Vermont, New York, and Pennsylvania, have produced further improvement. During 1880 about 15 per cent. of the sheep were removed from the state to the east and north. In addition to the loss caused by forced removal, only 48 lambs survived to every 100 breeding ewes; they represented but 21.1 per cent. of the total number of sheep in the flocks specially investigated. The increase for the year ending July, 1880, was but 26.78 per cent. on the flock of a year previous. From these facts we get an idea of the disasters in Colorado just before the investigation of 1880.

Our illustration below is of the business as it exists between the Platte and Arkansas water divide and to the Arkansas river. This region, about 100 miles east and west by 60 miles north and south, is generally a dry, treeless prairie, with an annual rainfall of 10 to 15 inches, the waters making their way from the divide to the Arkansas on an average slope of about 40 feet to the mile. Occasionally it appears in springs; otherwise it passes on below the surface, and its presence is indicated by the vegetation. As a rule, wherever auger and drill can reach water, there a sheep-camp can be made. But there are some areas of many miles where no water can be had. By established custom the possession of water commands the surrounding pasturage half way to the next water.

Take the experience of one flockmaster owning about 7,500 sheep in 1880. He owns about 500 acres of land, worth $5,000, and he leases 1,000 acres of school lands for 2½ cents per acre, or $25 per annum. His buildings and fences cost him $1,800; vehicles, harness, tools, etc., $450; four horses, $300; sundries, say, $200. His investment, then, putting the sheep (5,917) at beginning of the year to be worth each $2 50, is, in round numbers, $22,000. The 500 acres owned and the 1,000 leased cover the water privileges of 30,000 acres of public lands adjoining, and include meadow or other exceptional land reserved for hay, the different tracts varying from 40 to 100 acres in extent, sufficient in each case to control all the water. He employs four men throughout the year at $35 per month and board. Board may be estimated at 30 cents per day, so that the steady labor costs him $2,118 per annum. In addition he hires extra labor during lambing and shearing. For the former, five men, at $30 per month for forty days, which, with board added, makes $260. The cost of shearing the 5,917 adult sheep, at 7 cents per fleece, will be $414 19; to which is to be added the board of the shearers, or $40, if seven men shear for nineteen days with an average shear of forty-five fleeces each per day; these together make $454 19; with the incidentals of packing the wool, etc., we may put the extra labor of the shearing time at $500.

Another sheep-grower in El Paso county began business in 1872 with 770 Mexican ewes and 10 Vermont merino rams, at an aggregate cost of $2,100. July 1, 1880, he had 7,500 sheep, of which 151 were of the original stock of ewes, the whole flock worth $18,750, and his ranch outfits were worth $7,750; total, $26,500. Meantime, since starting in 1872, he had sold wool to the amount of $24,189 and 250 wethers for $625.

We may consider the flock year to begin when lambing and shearing are done. The sheep go on summer range about July 1. Changes from summer to winter grazing are generally but not always made. The main idea is to keep the flocks where there is grass, and in winter to have them sheltered, artificially or naturally.

For summer management the stock is divided into flocks, here always called "bands" (*a*); the numbers vary according to kind from 1,500 to 2,000 each, the ewes with lambs together, the wethers and dry ewes together, each flock under a special shepherd (here usually called "herder"), who is accompanied by a dog. The flock is put in an inclosure every night, for better protection.

The summer ranging continues until the last of November, when the sheep are moved to pasturage with sufficient cured grass, shelters from storm, and stored feed for emergencies. Before winter sets in weaker animals are separated from the flock and made into an invalid flock, with which, perhaps, the rams are run during the day. This flock receives special feed—hay or grain—as occasion requires. As a rule, feeding is not necessitated oftener than, perhaps, four winters in ten, but a prudent administration will always provide feed other than pasture for lambs and weaklings, and for rams before and during service.

Dry stock and wethers will stand almost any severity of weather on pasture alone; the use of hay on a sheep ranch is principally for the horses. About 1 ounce of corn per day to lambs, or 2½ ounces to other sheep, and twice the amount if oats are fed, is the usual ration for such as are fed. In 1880 corn delivered on the ranch in central-eastern Colorado cost $1 60 per cwt.; in 1879 it was worth $1 30; in 1878, while the deep snow lay, it was had at 90 cents. Hay sells from $15 to $20 per ton; cutting costs from $4 to $5 a ton.

The rams are turned in with the ewes from about the 10th of December to the 20th of January. They are, as a rule, put in with the ewe flock at night and taken out in the morning.

a The word "band" is used with very different meanings in different localities in the West; it is used for a flock, a herd, a drove of animals, a subtribe of Indians, etc. Among stockmen it is used as the common name for either flock, herd, or drove.

The more experienced flockmasters discard sheds except for lambing. High, tight corrals, with outlying snow and wind breaks, are preferred, as they afford sufficient shelter and protection, are more cleanly, less liable to induce disease, and the sheep do not overcrowd and smother themselves in storms.

Inasmuch as severe storms and exceptional years are such an important element in Colorado sheep-grazing, the following facts pertaining to the experience of previous years in this regard may be of value:

In the winter of 1871–'72 severe snow-storms caused great loss, and April 7 a terribly cold wind with fine snow (the "blizzard" of the plains) was very destructive. Stock was then run without any artificial protection. The man who owned the largest flock in the state at that time lost outright 17 per cent. of his sheep. The years 1874 and 1875 are memorable for extreme cold weather. The late storms during and just after lambing and shearing were the most disastrous. About the middle of June, 1876, there was a two days' storm of wind, snow, and hail. In the spring of 1877 again a like disaster came upon the flocks. During six weeks of December, 1877, and January, 1878, heavy snows remained upon the ground, in many places covering the pasturage entirely. One ranch, 18 miles east of Colorado Springs, lost 500 head out of 3,700 while that almost unexampled snow lay on the ground. The losses consequent were said to have averaged 20 per cent. of the sheep. One man who then had 6,000 sheep without pasturage, but who had provided hay the summer before and bought Kansas corn at 85 cents per cwt., carried his sheep through with but little loss. Many of his neighbors, less prudent, lost 50 per cent. of their stock. In March, 1878, an exceptionally heavy snowfall, which drifted badly, buried some flocks caught without corrals and snow-breaks.

The remarkable drought of 1879, extending until July, 1880, is elsewhere referred to. Mother ewes could not suckle their lambs. Sheep-owners were feeding grain in May and June, and then many fell short 33 per cent. of the usual proportion of lambs to ewes. The preceding spring had also failed in lambs, because the long, deep snow with frequent storms during December, 1878, and January, 1879, the breeding season, had affected the condition of both rams and ewes.

At the present time reports have been received indicating the worst winter (1880–'81) ever known in Colorado. They represent the drought of 1879 and 1880 to have been followed by such snows and cold that there has been a loss of 20 per cent. among the sheep of Colorado.

The experience of ten or fifteen years in sheep-raising and the consequent greater care and skill expended in the business seem to be offset by the delicacy of high-bred stock, an unusual severity of climate, and a pasturage depreciated because overstocked. Some wool-growers believed this in 1880, and were purposing to meet the first danger by breeding in a strain of southdown or cotswold. They argued that with the three-quarters breeding of the merino blood on the old Mexican stock they had reduced the hardiness and the fecundity of the original stock as far as it was safe in that climate and under their system of pasturage, and that more attention should be paid to the growing demand for mutton. As the Mexican blood diminishes, the herding instinct also decreases and the susceptibility to disease increases.

About May 10 the lambing season begins, when extra hands are employed for about forty days. Under good management the lambing flock is kept under vigilant guardianship on restricted pasture, the best available, and fed as necessary. In the case of high-bred sheep, the mother is immediately removed with her lamb to a pen where the two may be sheltered and safe from the annoyance of other sheep. With less valuable and more hardy stock, the ewes and their lambs are separated each morning from the flock. Docking, ear-marking, and castrating are done when the lambs are three days old. Then the mothers and lambs are gathered in what is called a "docked herd." When from 800 to 1,000 ewes with lambs are thus gathered, the flock is moved from the lambing-ground to another good range near by, where it remains until shearing. Shearing begins about June 20 to July 1.

In eastern Colorado the areas occupied by sheep were overstocked in 1880, and the occupation south of Arapahoe county and north of Las Animas, excepting a comparatively small region in northeastern Elbert and one not so small in southeastern Bent county, reached to the Kansas line. Weld and Arapahoe counties east of longitude 103° were not grazed by sheep. There were no sheep in eastern Las Animas county. Throughout western Colorado the occupation was very sparse. During 1880 a notable relief was afforded to the overstocked eastern regions by a movement of sheep into Kansas. Whilst cattle were occupying 93 per cent. of what we estimate to be approximately the total area of available pasturage, sheep were found on but 64 per cent. There remained unoccupied space apparently on which to graze about 650,000 under similar conditions to those existing where sheep were found. When stockmen talk of 20 acres as a sufficient pasturage for a cow and four for a sheep, they mean that those areas suffice when water is there uniformly accessible, but, as the fact rules over the state, 5,000 head of cattle need 200,000 acres (40 acres to the head), and 2,000 sheep must have a range of 15,000 acres.

Colorado flocks are subject to but few diseases. Scab prevails to some extent, and spread alarmingly, late in 1880, from a diseased flock of 18,000 driven in from California.

In Colorado, east of the Rocky mountains and north of the Arkansas river, where the stock business has assumed its greatest proportions, the number of sheep in 1870 was very small, and the feeling against them was strong. In 1880, throughout much of the same region, sheepmen almost controlled the occupancy by holding the range by virtue of title to all the land containing water. At the time of inquiries in Colorado, the average value generally put upon the so-called "arid" lands was 12 cents per acre.

Of eight flocks of Colorado sheep, aggregating 66,463 head in 1880, as compiled from answers to circulars, the composition was as follows: Rams, 649, or 1 per cent. of the whole; ewes, 29,213, or 44 per cent.; wethers, 22,559,

or 33.9 per cent.; lambs, 14,042, or 21.1 per cent. The estimated number of lambs dropped per 100 ewes was 85. Of these 48.07 per cent. survived to yearlings. The estimated average annual loss among sheep over twelve months old for a term of years was 8.5 per cent.

The average value of stock and mutton sheep in 1880 was: Rams, $15 to $50; ewes, $2 25 to $3; wethers, $2 25 to $3; lambs, $1 75 to $2 25; the average weight of mutton sheep was, live weight, 95 to 100 pounds; dressed weight, 49 to 53 pounds. The average annual wool clip in each class was: Rams, 10 to 14 pounds; ewes, 4 to 7 pounds; wethers, 5 to 8 pounds; lambs, 3 to 5 pounds. The estimated average annual loss among sheep over twelve months old for an average term of years is 8 per cent., made up by the following causes: Disease, winter and spring storms, wild animals, old age, poisonous weeds, and snake bites.

Scab is very troublesome, causing much damage to flocks, and is introduced anew nearly every season by trail-sheep driven in from New Mexico. Coyotes, wild cats, and black eagles are very annoying to flockmasters on the prairie, while among the foot-hills the larger carnivora are a source of danger to adult sheep as well as to lambs.

SLAUGHTER.—According to Special Abstract No. 9, Manufactures, Tenth Census, fourteen slaughtering establishments in the counties Boulder, Clear Creek, Custer, Arapahoe, Gilpin, and Lake, slaughtered 21,018 beeves having an average live weight of 991 pounds, valued at $675,390; 37,166 sheep having an average live weight of 104 pounds, valued at $107,415; 9,590 hogs, having an average live weight of 340 pounds, and valued at $106,410.

ESTIMATED MOVEMENT OF CATTLE, SHEEP, AND SWINE DURING 1880.

FROM COLORADO.				TO COLORADO.				
	Destination.	Cattle.	Sheep.		Source.	Cattle.	Sheep.	Swine.
Total		149,806	151,900	Total		21,880	61,420	14,540
By drive	Wyoming	50,000	8,000	By drive	California		10,000	
By drive	Arizona	2,000		By drive	Wyoming	10,000		
By drive	Nebraska	20,000	40,000	By drive	Texas	5,000		
By drive	New Mexico	5,000		By drive	New Mexico		50,000	
By drive	Kansas	30,000	103,900	By Colorado Central railroad	Wyoming and Nebraska	1,640	60	
By Union Pacific railroad	Chicago	18,560		By Colorado Central railroad	Iowa and Nebraska			340
By Atchison, Topeka and Santa Fé, and Kansas Pacific railroad	Kansas City	24,246		By Denver Pacific railroad	Wyoming and Nebraska	4,940	360	
				By Denver Pacific railroad	Iowa and Nebraska			5,700
				By other railroads, estimated	Blooded stock for improving herds; Swine for immediate consumption.	300	1,000	8,000

CATTLE, SHEEP, AND SWINE IN COLORADO AS REPORTED FOR CERTAIN YEARS.

Year.	Authority.	Cattle.	Sheep.*	Swine.
1870	Ninth Census (on farms)	70,736	120,928	5,509
1879	Biennial report of state auditor	536,823	779,935	9,765
1880	do	542,064	782,640	7,470
1880	Tenth Census (on farms)	340,839	746,443	7,658
1880	Tenth Census (on farms and estimated unenumerated ranch and range stock)	791,492	1,091,443	10,885

ESTIMATED CATTLE, SHEEP, AND SWINE IN COLORADO JULY 1, 1880.

Sections.	Sections defined.	APPROXIMATE ACREAGE OF STOCK OCCUPATION.		STOCK.		
		Cattle.	Sheep.	Cattle.	Sheep.*	Swine.
	Total	42,558,000	29,209,535	791,492	1,091,443	10,885
Eastern	East of the Rocky mountains: *i. e.*, east of western boundaries of Larimer, Boulder, Gilpin, Jefferson, El Paso, Pueblo, Huerfano, and Las Animas counties.	30,000,000	21,736,535	613,466	970,585	8,617
Western	West of the Rocky mountains: west of above division	12,558,000	7,473,000	178,026	120,858	2,268

* See note to Texas tables, p. 31. Indian stock is included in above.

Total land area of state	acres	66,332,800
Total approximate area of available pasturage	do	45,440,000
Total area of unoccupied available pasturage	do	2,882,000
Total population		194,327

AVERAGE DENSITY OF STOCK (CATTLE AND SHEEP) OCCUPATION.—Making one head of neat stock the unit of stock, and considering five sheep to equal one head of cattle in relation to consumption of pasture, we have 1,009,781 units of stock, occupying 42,558,000 acres, or 42.15 acres to the head.