Circular No. 49 - This Public Domain of Ours

George Stewart

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THIS PUBLIC DOMAIN OF OURS

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IN CHARGE OF COOPERATIVE INVESTIGATIONS WITH
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*On leave.
In Utah are somewhat more than fifty-two and a half million acres of land. Of this about five million acres are in farms, but only 1,371,000 acres, or 2.6 per cent, are irrigated. In addition there are about 344,000 acres under dry-farm culture, making a total of 1,715,000 acres of improved land. This leaves all of Utah’s fifty-two and a half million acres, except about 3.5 per cent, to be utilized by some means other than crop-growing. There will be some addition of new lands not in farms and some development in unimproved farm lands, but when every development that can be reasonably expected is allowed for, it does not seem likely that more than about two and a half million acres will ever be devoted to crop-growing. With only 5 per cent of its total area capable of being tilled, Utah may just as well
face the fact that 95 per cent of all its land must be utilized, if it is ever to be economically utilized, in some other way than crop production.

Countless ages ago when the land rose out of the sea and was left in its present position both as regards latitude and topography—ever since that day Utah was predestined to obtain the agricultural income from more than nine-tenths of its area thru the grazing of animals. It is fundamental to a proper understanding of this problem, that it be recognized that all land (except perfectly bare spots, such as alkali flats, for example) produces plants of some forage value. Even deserts bear vegetation except in isolated areas. Much of this vegetation is coarse, thorny, or nearly leafless. Unpalatable tho it appears, much of it can be eaten by animals, if only the right sort of animal be brought to the district in the right season of the year.

Too often the lack of water has led the uninitiated to deem the absence of grazing animals a good indication that there is nothing for them to eat. As a matter of fact, it is merely that there is nothing for them to drink and not that the plants are unadapted to grazing. There is no area of any considerable size where the plants themselves are not adapted to some class of grazing animal in one season or another. The uniformity of over-grazing, even on our most desert-like areas, is all the proof this statement needs. The driest and most forbidding tracts of the state make good winter range when snow can serve in place of water. Much land is poorly adapted to cattle alone and much to sheep alone, but the proper combination of cattle, sheep, and goats leaves little in the way of native plants that cannot be utilized at some time of the year. Possibly turkeys need also to be regarded as grazing animals.

**HISTORY**

Thoro as it might be, an analysis of the public domain in any single part of the United States cannot be understood separately. The acquirement, history, utilization, deterioration, disposal, and future policy of the public domain is essentially national, on account of its having been handled almost from the beginning as property of the Federal Government. Except for land donated by Congress to the states to be disposed of as they saw fit, the income from which must be used principally for maintenance of schools, practically all publicly owned land in the United States is the property of the nation. However, some of the original colonies and Texas still own land which has never
belonged to the nation. A somewhat detailed account of the acquirement of our public domain will probably do more to clarify the matter than will any other thing.

**ACQUIREMENT**

It is necessary to understand from the outset, that the history of the United States is principally a history of the acquirement and settlement of vast land areas. The most of this has been almost entirely at the disposal of Congress, in the beginning Congress held no land. Before the end of the Revolution the Virginians had moved into Kentucky, and the North Carolinians into Tennessee. Boone and his "long hunters" just overflowed into the Ohio River Valley. Washington had surveyed there himself and had become interested. The Indians, Spaniards, and British contested the individual advance of these men. It made no difference to them that the land was not definitely the property of the states they represented. They saw it; it looked good; and they merely took possession.

In the Northwest Territory the opposite was true. The great tract of land that lay between the original colonies and the Mississippi River and between the Ohio River and the Great Lakes was from the beginning property of the nation and was handled as such. While the pioneer settlements of Kentucky and Tennessee were struggling with the Indians and Spaniards almost as if they were no part of the nation, the Northwest Territory enjoyed the protection, such as it was, of Federal troops. South of the Ohio the battles of Blue Licks and the Big Kanawha were fought by local volunteer militia, whereas the battles of the Wabash and Fallen Timbers were fought by the national army under St. Clair and "Mad Anthony" Wayne. A great deal of bitterness grew out of this treatment of Kentucky and Tennessee. More than one plot of separation and independence was openly talked about, and the independent state of Franklin did actually exist for about three years. Public land in Tennessee was even later returned to the state.

Roosevelt makes clear the difference in settlement of the region north of the Ohio River from that to the south. That a land policy was being somewhat unconsciously evolved is made clear in the following extracts:\(^1\):

"So far the work of the backwoodsmen in exploring, conquering, and holding the West had been work undertaken solely on individual initiative. The nation as a whole had not directly shared in it. The frontiersmen who chopped the first trails across the Alleghanies, who earliest wandered thru the lonely western lands, and who first built stockaded

\(^1\)The Winning of the West (Sagamore Series) Part V., pp. 5-9.
hamlets on the banks of the Watauga, the Kentucky, and the Cumberland, acted each in consequence of his own restless eagerness for adventure and possible gain. The nation neither encouraged them to undertake the enterprises on which they embarked, nor protected them for the first few years of uncertain foothold in the new-won country. The men who controlled the immediate destinies of the confederated commonwealths knew little of what lay in the forest-shrouded country beyond the mountains.

"Of course some help was ultimately given by the parent States; and the indirect assistance rendered by the nation had been great. The West could neither have been won nor held by the frontiersmen, save for the backing given by the Thirteen States. But the real work was done by the settlers themselves. The distinguishing feature in the exploration, settlement, and up-building of Kentucky and Tennessee was the individual initiative of the backwoodsmen.

"The direct reverse of this was true of the settlement of the country northwest of the Ohio. Here, also, the enterprise, daring, and energy of the individual settlers were of the utmost consequence; the land could never have been won had not the incomers possessed these qualities in a very high degree. But the settlements sprang directly from the action of the Federal Government, and the first and most important of them would not have been undertaken save for that action. The settlers were not the first comers in the wilderness they cleared and tilled. They did not themselves form the armies which met and overthrew the Indians. The regular forces led the way in the country north of the Ohio. The Federal forts were built first; it was only afterwards that the small towns sprang up in their shadow.

"The National Government ceded to settlers part of its own domain, and provided the terms upon which states of the Union should afterward be made out of this domain; and with a wisdom and love of righteousness which have been of incalculable consequence to the whole nation, it stipulated that slavery should never exist in the States thus formed. It was founded not by individual Americans, but by the United States of America.

"Wild and lawless adventurers had built cabins and made tomahawk claims on the west bank of the Upper Ohio. They lived in angry terror of the Indians, and they also had cause to dread the regular army; for wherever the troops discovered their cabins, they tore them down, destroyed the improvements, and drove off the sullen and threatening squatters."
both Carolinas—claimed land in the West. Georgia’s claim was too near to the Spanish at New Orleans to be of actual consequence except for the power to make a wrangle which they did and drove a hard bargain with the National Government for the land. New York claimed to be heir of the Iroquois country and the other states held charters, none of which claims an independent nation would have even considered. The new nation, however, had to extinguish these claims by some method which would satisfy the states and still preserve the Union.

Maryland, a non-claimant, urged that all state claims be made void, but since Maryland had nothing to relinquish and since Virginia was feared much as a modern European state fears a rival, Congress was not able to follow such advice. On several
occasions it looked as if the Confederacy might break over the land question. As a result, compromise and concession, instead of justice or ultimate good, became the method of settlement. New York led out in 1780 by turning over to the nation all rights to land claimed. Virginia held on till 1784 and then ceded to Congress her claim to the country north of the Ohio in lieu of outright ownership to a large tract for her Revolutionary soldiers and for complete right in Kentucky. In 1786, Connecticut ceded her claims but not until about 5000 square miles in what is now northern Ohio was assigned to her. This was the origin of the Western Reserve. North Carolina claimed Tennessee, ceded it, and then retracted and jangled until the land was returned. South Carolina claimed a very small strip only. Thus at last Congress established an unchallenged title to the Northwest Territory, and to a considerable area south of the Ohio. By 1802, the nation owned 259 million acres of land besides what the States claimed.

In Kentucky and Tennessee and southward the frontiersman did his own surveying, taking irregularly shaped plats, overlapping on some corners, and leaving odd-shaped areas unclaimed. Later endless litigation grew out of this system, but in the Northwest Territory Congress provided for a government survey whereby range and base lines laid-off townships 6 miles square with 33 sections in each township, a section consisting of a square mile, or 640 acres. These were sub-divided into "quarter sections" and these again into "forties". There was no overlapping and no odd corners. Section No. 16 in each township was assigned to schools; Congress undertook to sell the remainder.

According to Hamilton's plan the land was to be the great national resource, and it was, but not to the extent anticipated. Pioneering, then as now, ran on too narrow a margin to permit of a high price being paid for unbroken land.

Tho pioneers have never been able to add great wealth to the nation directly, they have by conquering the wilderness and driving out the Indians left the land as a heritage to the next generation who could add improvements and build towns. The value of land consists, therefore, chiefly in cumulative labor investments.

All other additions to the territory of the United States, with the single exception of Texas, came in such a manner that the land was first owned by the national Government and held completely at the nation's disposal. Part of the original area of Texas embraced a part of the present states of Kansas, Colorado, and New Mexico. This was purchased in 1850 for $16,000,000.
Steps in the acquirement of our public domain are summarized in the following table:

<table>
<thead>
<tr>
<th>Date</th>
<th>Territory</th>
<th>How Obtained</th>
<th>Area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1784-1802</td>
<td>East of Mississippi</td>
<td>State cessions</td>
<td>259,171,787</td>
</tr>
<tr>
<td>1803</td>
<td>Louisiana Territory</td>
<td>Purchase (France)</td>
<td>565,166,080</td>
</tr>
<tr>
<td>1819</td>
<td>Florida</td>
<td>Purchase (Spain)</td>
<td>44,639,300</td>
</tr>
<tr>
<td>1846</td>
<td>Oregon Country</td>
<td>Treaty with England</td>
<td>191,795,200</td>
</tr>
<tr>
<td>1848</td>
<td>Mexican Cession</td>
<td>War with Mexico</td>
<td>334,343,520</td>
</tr>
<tr>
<td>1850</td>
<td>Southern New Mexico and Arizona</td>
<td>Gadsden Purchase (Mexico)</td>
<td>$10,000,-000</td>
</tr>
<tr>
<td>1850</td>
<td>Adjacent parts Kansas, Colorado, and New Mexico</td>
<td>Purchase (Texas)</td>
<td>61,892,420</td>
</tr>
<tr>
<td>Total</td>
<td>Continental United States except state land reserved</td>
<td>about</td>
<td>1,486,000,000</td>
</tr>
<tr>
<td>Less</td>
<td>Return of Tennessee lands to North Carolina</td>
<td>about</td>
<td>31,000,000</td>
</tr>
<tr>
<td>Net</td>
<td>Public Domain</td>
<td></td>
<td>about 1,455,000,000</td>
</tr>
</tbody>
</table>

**LAND POLICY AND DISPOSAL**

At first he who was there took land as he would, and he held who could. Indians often drove out individual settlers, and tho the land was subdued in the end it was often permanently occupied by other families than those who first tomahawked the claim.

After the Constitution was adopted in 1784, control of the Northwest Territory was provided in the Ordinance of 1787 which made six provisions as follows:

1. Freedom of worship and religious belief
2. Trial by jury, habeas corpus, etc.
3. Respect of Indian lands and establishment of schools
4. Any new states formed should be forever part of the United States
5. Not less than three nor more than five states should be made from Northwest Territory
6. No slavery permitted

At first glance these regulations may not appear to have much to do with land questions, but they had some of the most far-reaching consequences of any legislation ever written. The prevention of slavery meant individual farm ownership instead of the plantation system; it also preserved the dignity of manual labor, without which real progress is impossible. Religious freedom and courts of justice encouraged more settled folk to replace the turbulent and quarrelsome frontiersmen who were
practically border ruffians. Then the provision for the new colonies to become states equal in governmental right to the old was a new departure in colonization. Herein lies one of America's great forces of expansion and growth.

Fig. 2. Land now available for homestead entry, given in percentage of county areas. (After Henderson, U. S. D. A.)

Legislation—Hamilton made the first policy for land disposal. His plan and a brief summary of subsequent legislation are given by Wilcox as follows:

"That in the formation of a plan for the disposition of the vacant lands of the United States there appear to be two leading objects of consideration; one, the facility of advantageous sales, according to the probable course of purchases; the other, the accommodation of individuals now inhabiting the western country, or who may hereafter emigrate thither. The former, as an operation of finance, claims primary attention; the latter is important as it relates to the satisfaction of the inhabitants of the western country... Purchasers may be contemplated in three classes; moneyed individuals and companies who will buy to sell again; associations of persons who intend to make settlement themselves; single persons or families.....

"A plan for the sale of the Western lands, while it may have due regard for the last, should be calculated to obtain all the advantages which may be derived from the two first classes.'

"Hamilton accordingly recommended that the lands be sold in any quantities without limit and that convenient tracts be set aside for location by settlers in quantities not to exceed 100 acres to each person. Hamilton thus clearly foresaw the three chief sources from which have come demands for the public lands, viz.: land speculators, settlement colonies, and homesteaders.

Grazing Industry, pp. 8-10.
"During the first years of its existence the Government of the United States needed money and the public lands were naturally looked to as an important source of revenue. In 1795 a law was passed turning the proceeds from the sales of public lands into a sinking fund for the redemption of the public debt. In 1796 Congress provided for the sale of lands in Ohio in sections and quarter townships at $2 per acre. In 1800 a unit of 320 acres east of the Muskingum and 640 acres west of that river was established, together with the system of disposition through registers. The same act provided for the leasing of the public domain in sections or half sections for a term not exceeding seven years. Certain lands were offered for sale in tracts of 160 acres. In 1820 Congress provided for the sale of 80-acre lots of land at a minimum price of $1.25 per acre, with a "double minimum" of $2.50. The various prices at which land was sold between 1785 and 1880 were 12 1/2, 25, 50, 66 2/3, and 75 cents and $1.00, $1.25, and $2.50 per acre.

"Between 1801 and 1841 sixteen preemption acts were passed. The fundamental idea contained in these acts was to give settlers preference over land speculators. This system in its final form gave settlers the right to occupy public land in areas of not more than 160 nor less than 40 acres, for a certain period at the end of which they were required to pay $1.25 per acre for the land. While according to the Preemption Act a premium was set upon actual settlement, yet title to the land could not be acquired except by purchase. The Preemption Act is thus clearly distinguished from the Homestead Act, according to which final title to the land can be obtained merely from a residence of five years. The idea of holding the public lands for revenue thus gave place to that of devoting them to the encouragement of settlement. The agitation for free homes for settlers, however, did not assume a definite shape until the formulation of the platform of the Free Soil Democracy in 1852, the 12th plank of which read as follows: 'That the public lands of the United States belong to the people, and should not be sold to individuals nor granted to corporations, but should be held as a sacred trust for the benefit of the people and should be granted in limited quantities, free of cost, to landless settlers'.

"This proposition was kept constantly before the public until, in 1862, the Homestead law was enacted. The idea of free home was thus realized. The Homestead law made possible the acquisition of complete title to 160 acres of land by a residence of five years upon the selected location. A commutation clause was subsequently added according to which the settler, at the end of six months' residence on his claim, could at once secure title by the payment of $1.25 per acre.

"The Timber Culture Act, passed in 1873 and amended in 1874, enabled settlers to acquire title to 160 acres of land on condition of growing a certain amount of timber. In 1875 an act was passed permitting the sale of desert lands in California in areas of 640 acres at the rate of $1.25 per acre. The "Desert Land Act" was passed in 1877 and made to apply to the Dakotas, Montana, Idaho, Washington, Oregon, California, Wyoming, Utah, Nevada, Arizona, and New Mexico. The unit of sale was 640 acres and the settler was allowed three years in which to get water on the land. Under this act the land cost $1.25 per acre but residence was not necessary.

"By utilizing the Preemption, Homestead, Timber Culture, and Deseret Land Acts it was possible for one person to secure title to 1,120 acres of land; but the Deseret Land unit was later reduced to 320 acres and in 1891 the Preemption and Timber Culture acts were repealed".

During the last few years, some desirable adjustment has come about in the Enlarged Homestead Act which permits a man to acquire 320 acres of arid land for dry-farming. His wife
can take a similar amount. The Grazing Homestead permits a man to take 320 acres and apply for an additional 320 acres. As will be shown, however, all the land laws now in force are completely inadequate for the settlement of land not suited to crop production.

**Fig. 3.** Land still owned by railroads and open for sale or lease. Each dot represents 500 acres. (After Henderson, U. S. D. A.)

**Special Grants.**—As settlement pushed westward far away from population and governmental centers, it became desirable to encourage the building of railroads before the traffic would justify the heavy costs of construction, especially across the Rockies. Congress therefore made great concessions in land to companies who built and operated railroad lines. Large tracts of land passed out of public ownership in this way, chiefly by giving outright to the railroad companies alternate sections for a given number of miles (usually 20 to 50) on each side of the right of way. More than 155 million acres have been disposed of in this way.

Cessions of one section in each township were granted to states for schools. This was later increased to two sections and in some arid regions has finally been added to by outright assignment of land for public schools, land-grant colleges, and similar purposes. This accounted for more than 190 million acres.

Then soldiers and sailors have always had the right to take
land as compensation for military service. At first this was immediate ownership but was later modified to permit them to apply the time in service toward satisfying homestead claims, except that 7 months' actual residence was required. Following the Civil War, "land scrip" was issued to the men who had been in military service. This scrip could be traded for any land in continental United States. Much of this scrip was bought up and applied on timber-land or land bearing resources many times its agricultural value. Great frauds were perpetrated in this way. Only recently has the scrip all been used. All told, something more than 66 million acres of land has been alienated in payment for military service.

Of the 1455 million acres of public domain (1924), all has passed out of government control except about 185 million acres, or 13 per cent of the whole. The remaining public domain lies almost entirely west of the Mississippi and is principally land not suited to easy agricultural development in the ordinary sense. Much of it is mountainous or "desert" land or bears some other handicap such as swamps, stumps of cut-over timber, or land too far from water (either for irrigation or for culinary use), or else isolated by transportation difficulties. Much good land lies at altitudes so high as to make untimely frosts a limiting factor in crop-growing. The remaining public land is distributed by states as shown below:

<table>
<thead>
<tr>
<th>Vacant public land in eleven western states</th>
<th>1918</th>
<th>1923</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>21,256,010</td>
<td>14,951,860</td>
</tr>
<tr>
<td>Colorado</td>
<td>10,271,955</td>
<td>7,753,129</td>
</tr>
<tr>
<td>California</td>
<td>20,529,034</td>
<td>18,091,187</td>
</tr>
<tr>
<td>Idaho</td>
<td>13,322,716</td>
<td>10,040,912</td>
</tr>
<tr>
<td>Montana</td>
<td>8,201,019</td>
<td>5,908,156</td>
</tr>
<tr>
<td>Nevada</td>
<td>55,082,200</td>
<td>52,690,645</td>
</tr>
<tr>
<td>New Mexico</td>
<td>19,115,554</td>
<td>16,491,564</td>
</tr>
<tr>
<td>Oregon</td>
<td>14,325,591</td>
<td>13,677,583</td>
</tr>
<tr>
<td>Utah</td>
<td>31,475,919</td>
<td>25,242,338</td>
</tr>
<tr>
<td>Washington</td>
<td>1,259,983</td>
<td>1,184,558</td>
</tr>
<tr>
<td>Wyoming</td>
<td>25,434,194</td>
<td>18,717,183</td>
</tr>
</tbody>
</table>

Small tracts throughout the country will be added to our agricultural area, but there are no more extensive regions of good farming land left. It is mainly because of this that the price of land has advanced so rapidly during the last few years. Recent investigations on reclamation projects indicate that the handicap of high cost of bringing water to the land will greatly retard the development of such areas as can be reclaimed in no other way. Swamps, uneven topography, long distance to rail-
roads, stumps, and untimely frosts are all handicaps that vary in degree with each piece of land from only a slight retardation to complete prohibition of crop-growing.

Fig. 4. Land classified available for 640-acre grazing homesteads. The small map shows land designated as 320-acre enlarged homesteads. The large map indicates land suited only for grazing. Each dot represents 5000 acres. (After Henderson, U. S. D. A.)

ORIGINAL CONDITION OF OUR PRESENT PUBLIC DOMAIN

As pioneer settlers moved out of the forested regions east of the Mississippi they came into open, rolling prairie land. In a few years the "little prairie" and then the "big prairie" was each occupied, and the wave swept into a region of vastly different possibilities but of not greatly different appearance. True,
long grass gave way to short grass, but it was still grass and seemed to be the same. The difference was that to be due to firing on the part of the Indians. Settlers had always encountered drought and waited till it passed. Now, however, they were in the region where drought was the usual, and plenty the unusual, occurrence. Native vegetation was resistant to drought and cured standing. In the Southwest were species which did not die down to the ground each year. All this lent strength to the idea that this region could support cattle without number.

After 1833-34, when military posts were established in the region west of the Missouri River, record of the arid region began to be made, chiefly in letters. In 1847 the Mormon migration began, while in 1849 the influx to California became a rush. Thousands of horses, mules, and oxen were wintered on the plains and in the valleys of the Rocky Mountains without hay or grain. The climate and vegetation were such that the grasses cured standing almost as well as if they had been made into hay. For the first few years in Utah practically all the animals wintered on the cured grasses without other feed or shelter of any sort. After Johnston's army came to Utah in 1857 the army animals were wintered entirely by grazing.

In the Rocky Mountains and westward to California, the grasses formed sod only in the wetter sloughs and well-watered valley bottoms. On the benchlands and foothills the bunch-grasses were interspersed with weeds and small brush. In the more favorable spots the giant rye-grasses (Elymus sp.) grew as tall as a man and sometimes taller. Many a load of hay was cut by hand with scythes and hauled into the settlements. As feed abounded everywhere, and grass grew right among the sages or with only a few sages in grassy places, there was no threat of injury or protection. Sagebrush has greatly multiplied since grazing began, due principally to its being eaten less completely than the more palatable grasses or herbs. The same condition prevailed in the eastern foothills and on the higher plains, only here the short sod-grasses were dominant except in less favored regions. In the driest parts bunch-grasses prevailed but were plentiful enough even for wintering stock. Immense quantities of feed were wasted every year and gave rise to extravagant notions of the carrying capacity of the region. The following extracts show the forage condition of the country and also the impression created on enthusiastic men.

J. W. Iliff, a stockman of Cheyenne, Wyoming, wrote at sometime before 1870:

"I have been engaged in the stock business in Colorado and Wyoming for eight years, and consider the summer-cured grasses superior to hay. My cattle have not only kept in good order on this grass through all the eight winters, but many of them, thin in the fall, have become fine beef by spring. During this time, I have owned 20,000 head of cattle. The percentage of loss is much less than in the States where cattle are stabled and fed on corn and hay".

Alexander Majors\(^4\), a professional freighter (before 1870), wrote:

"I have been grazing cattle on the plains and in the valleys and mountains for twenty years, and during that time never had less than 500 head of work cattle, and for two winters, those of 1857 and 1858, I wintered 15,000 head of heavy work oxen on the plains each winter. My experience extends from El Paso, on the Rio Grande, to one hundred miles north of Fort Benton, in Montana. Our stock is worked during the summer, and comes to the winter herding-ground thin. There it grazes without shelter, hay and grain being unknown. By spring the cattle are in good working order, and many of them are fat enough for beef."

General L. P. Bradley\(^5\), of the U. S. Army, quartered at various posts (also before 1870), described the country as follows:

"The value of this country for grazing may be estimated from the fact that good, fine grasses grow evenly all over the country; that the air is so fine that the grasses cure on the ground without losing any of their nutriment; and that the climate is so mild and genial that stock can range and feed all winter, and keep in excellent condition without artificial shelter or fodder. . . . I believe that all the flocks and herds in the world could find ample pasturage on these unoccupied plains and the mountain slopes beyond . . . ."

Here was a great undeveloped resource. Like all good things it was thought to be without limit. It took time and sad experience to convince enthusiasts that this was not the case. If only there had been the vision to look a bare half century ahead and provide against wanton waste and destruction, this story might have been different. But it is far easier to see mistakes in the backward look than in the forward.

**DETERIORATION**

Grazing began in Virginia almost immediately after Jamestown was settled in 1607. During 1609 and 1611 cattle shipments were received in Virginia, and the animals were turned loose in the open woodlands and glades to graze. Tobacco, the chief cultivated crop, exhausted the already poor soil and caused frequent moves, one farm being abandoned and another broken. Some historians picture "the move" with droves of cattle being driven along. By 1673, only sixty-four years after the founding of James-

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\(^4\)Ibid, p. 303.

\(^5\)Ibid, p. 304.
town, there were so many cattle that the winter feed was almost completely lacking. Even in the mild Virginia climate, 50,000 head of cattle died that winter. This, however, was in no way a permanent setback to the grazing industry, because fifty to seventy years later when European visitors traveled thru the colonies they found cattle everywhere in coastal areas of North Carolina and in the foothill region of Virginia. By the time of the Revolution, round-ups were in vogue, as is shown by one of Greene’s battles being at Cowpens. Many of Sumter’s and of Marion’s men were cowboys.

Then cattle went thru Cumberland Gap to Kentucky and Tennessee where grazing became important but was held partly in check by Indians and forest. Still it prospered. Before many years cattle were driven into Louisiana and Texas ahead of Spanish introductions. Meanwhile, every state from New York and Pennsylvania to Iowa had epochs of grazing, while crop production was in the pioneer stage. Great stretches of open grass on the Plains, however, gave cattle ranching its really great boom. Immense Mexican land grants in Texas were starting points before Texan independence. Following annexation immense ranches grew up in a few years, but cattle were so cheap that just preceding the Civil War many ranches were abandoned and the cattle “ran wild”. Then as war caused prices to pick up from $4 or $5 a head to $15 or $18 the boom set in; as New Orleans and other southern towns could not utilize the cattle, they were driven north to loading stations on the railroad; for several years Abilene, Kansas, and Olgallalla, Nebraska, were favorite loading points. Great drives carried anywhere from 35,000 (1867) to 600,000 (1871) head north each year over what was known as the “Texas cattle trail”.

Overgrazing.—Since cattle on the drive must have water, they were herded along very much over the same general routes. Naturally after several herds had passed over a tract and bedded at the same water holes, feed began to grow short, especially around the watering places. This was one of the first big-scale signs of overgrazing. The business, nevertheless, was so profitable that great companies were promoted and cattle were sold to new concerns rather than to meat markets. English and Scotch capital flowed rather freely into the Plains region and ranching spread northward and westward into the less favored areas. For a time there was overproduction and low prices, with a consequent loss of many investments. Overgrazing began to manifest itself as bare ground around watering holes and scarcity of

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winter feed. Heavy losses now took place with every winter that was more severe than normal. Then in 1886 great losses occurred due to lack of winter feed, heavy snow, and extreme cold in Colorado and Wyoming. Drouths of unusual intensity occurred in Arizona and New Mexico in 1893-94, causing innumerable cattle to die of starvation.

Fig. 5. Denuded range in southeastern Utah. This emphasizes the need of control. (Courtesy John T. Caine III)

About this time tramp stockmen began to pass thru the country, grazing first on one range and then on another. Sheep, moved in this fashion, could almost clean off a range in one passage. This forced resident stockmen to graze much heavier than they would otherwise have done of their own choice, in order to keep out tramp herds. When spring came, as animals were thin and needed feed, they were driven at once to the greenest early feed and then to the next before another stockman moved his animals to that range. In the Mountain region, such as Utah, this practice of early grazing came to be especially pernicious as animals might follow the receding snow far up. Others coming behind ate the second and third growth as soon as it started. In a few seasons plants weakened and died and either poorer forage plants, brush, or weeds occupied the ground, or even no

growth at all, especially on permanent bed grounds, where the nearly useless Douglas knot-weed predominated. Under heaviest and earliest grazing, only those plants that were not eaten before seed production persisted.

In 1898 Bentley estimated that there was in central Texas a region 100 miles by 200 miles in extent that had at one time been able to support 400 cattle to the section. About half of this, or 10,000 sections, was range land. He counts 320 cattle to the section as really conservative for 1880, but allows that only sixty-four could feed on a section by 1898. This decrease of 80 per cent is probably exaggerated, but it does indicate what was happening. Barnes and Jardine, however, indicate that there had occurred from 1905 to 1914 in the eleven far-western states a deterioration of about 50 per cent, at least in some regions, and implies that this does not include a considerable previous decrease in carrying capacity.

Most of this trouble arose because of "free grass". Since the land was public domain no one had a right to fence it, tho some fencing was done. The ranchers made a code for themselves as to territory and privileges. "Range rights", as these understandings were called, meant nothing to a tramp stockman who merely drove thru the country. As bands of sheep were under herders they could go almost where they chose. In some localities resident cattlemen surrounded the few water holes and shot sheep as they came in. The temptation to "take a shot" at a particularly aggressive sheep herder or cowboy soon became too strong to be resisted. There were several feuds in which a dozen or so men were killed. Possibly Tonto Basin in Arizona was the scene of the worst of these feuds from the standpoint of men killed, but there were dozens of cases similar in character. Firearms were not the only weapons used; night stampedes into sheep herds, poison, fire, and driving herds into swollen streams were all tried one place or another.

Erosion.—With these conditions prevailing, the range lands rapidly went from bad to worse. The plant cover was broken thru and soil began to move downhill more rapidly than under ordinary circumstances. Fine rich top soil was eroded from the whole surface; gullies developed in trails and down bare slopes. Soon these grew into washes and then into ravines. Stream flow became unusually high in spring and low in late summer. Small towns, on the upper Virgin in southern Utah, as an example, had been built in the narrow valleys; the land was

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farmed and produced abundantly. Due to over-grazing of the range on the watersheds, in some cases floods have brought down coarse gravel and with it covered the good soil; in other cases most of the good surface soil has gone down stream to bury some other area or to form a "quicksand" in the lower reaches of the river where animals "bog" as they try to get out to water during the period of small flow.

Drainage channels have become so well established in many places that practically no water from heavy rains sinks into the soil. In certain cases this is almost entirely a symptom of an advanced stage of overgrazing; in others, mountain slopes are so steep that no sort of plant cover possible in the region could prevent floods, tho unwise grazing makes all conditions more acute. The most recent disasters of this sort occurred in Utah during August, 1923, at Farmington and Willard. These two manifestations of a heavy storm gained prominence on account of loss of life. This was strictly incidental, for it merely happened that people were camping in Farmington Canyon and that a family or two dwelt right in front of the Willard ravine. Land destruction, however, always occurs both on the mountain side and in the valley below.

Fig. 6. Occasionally good farming land is irremediably covered with boulders. Willard, Utah, August, 1923.

Floods.—Altogether at Farmington about 170 acres of farming land was covered, of which sixty-five acres was so heavily
strewn with immense boulders and buried so deep as to be irreclaimable. Considerable of these sixty-five acres was high-priced truck and orchard land and varied in value from $200 to $500 an acre.

Besides the boulder-strewn area, 105 acres were spread over with mud varying in depth from three feet to a few inches. The mud consisted of gravel, sand, and clay mixed in all sorts of proportions but so entirely lacking in organic matter as to be of very low crop-producing value. The most optimistic agriculturist could not possibly anticipate, where this debris was deep, that less than from four to five years would restore it to anything like previous yielding power. Much of this land will not in this generation grow the crops it once did.

At Willard twenty homes were damaged and probably twice as much land was damaged as in Farmington.

Often the landscape itself is scarred beyond repair. A great tract of boulders such as spread across Willard cannot be moved. They will remain naked and unlovely for years and years. In a short time the fences will be replaced, the houses and barns repaired or removed, but gigantic boulders weighing tons will remain. A rock six feet long and four feet thru will contain approximately 60 to 70 cubic feet, each of which weighs about
150 pounds, making a total weight of about 10,000 pounds, or five tons. Many of the boulders around Willard are much larger than this. There are thousands and thousands of smaller rock to remove, which would cost at least twenty times the agricultural value of the land. In an acre there are 4840 square yards. Assuming the debris to be sand and dirt and only three feet deep, it would cost about $4000 or $5000 to clear an acre, even if there were any place to pile it. Heavy rock would cost several times as much to move as sand and gravel; moreover, considerable areas are covered four to six or more feet deep.

Cause of Floods.—On a steep mountain front, such for example as that which faces westward along the Wasatch Range from Salt Lake City to beyond Brigham, it is only the larger streams that have developed water courses which are longer and deeper than mere ravines. When heavy electric storms converge in a single locality and strike the mountain front, there frequently occurs a terrific downpour, popularly known as a “cloudburst”. Except in the well-developed stream valleys the slope is too steep, the soil too shallow, and the plant covering too sparse to hold the raindrops long enough to permit their sinking into the ground. As a consequence, the accumulating water runs first as tiny rills and then as streams into the main gully where a torrent forms.

Throughout all geological ages high lands have been eroded; throughout all ages yet to come they will continue to move downward. When this movement is rapid, settlement is difficult and precarious. Fortunately, habitable lands usually have watersheds that wear away at a rate sufficiently slow to permit the streams to dispose of the debris and to permit grasses, shrubs, and trees to maintain their footing for “plant cover” as it is called. In such a region, streams flow muddy from surface run-off at “high water” season but are supplied entirely from springs during the remainder of the year.

On the mountains east of Sanpete Valley, there has been conducted a set of careful long-time experiments to control floods. Manti, Ephraim, and Mt. Pleasant, Utah, have all had floods nearly as bad as the recent one. There is a U. S. Forest Service Experiment Station in Ephraim Canyon, where among other investigations soil erosion and water run-off receive attention. Near the top of the mountain is a cement-lined, two-roomed, cellar-like structure covered with a wooden roof. Into the upper end of this leads a small gully that catches all the drainage water from a ten-acre tract of range pasture land. During a storm the surface run-off pours into the first cellar
compartment. This, when filled, overflows into the next and is there retained. The sediment settles and is sluiced out after being computed carefully in cubic feet. There is also another plat of similar location, vegetation, and drainage. Its settling tank is placed so as to catch the drainage from exactly ten acres. The two areas were similar in all respects except that one has a better plant cover.

Altho both plats have the same exposure, the rainfall in the two areas differs considerably for any given storm but not for the year. During the summer months of 1915, for example, only one storm\(^{10}\) produced run-off. On July 21, the plat that had begun to erode received 0.70 and 0.81 inch in its two gauges, whereas the other plat which still bore its sod cover received 1.48 and 1.38 inches in its two respective gauges. In spite of the fact that the over-grazed plat received only one-half as much rainfall as did the other during the sixty-five minutes of storm, its run-off was 3019 cubic feet of water which carried 717 cubic feet of sediment, compared to 335 cubic feet of water and 94 cubic feet of sediment from the plat that was only slightly eroded.

A person could dig thru five inches of beautiful black leaf-mold and about a foot of friable soil to a heavy, impervious hard-pan. This was on the non-eroded area, whereas on the eroded plat only the impervious clay remained, the black mold and the friable soil having been previously carried away. In the first spot, grass roots held the mold and soil firmly in place. This porous surface readily absorbed the rain and allowed it to percolate into the soil where it could come in contact with the plant roots. Once the sod was broken thru rills developed and the surface mold was washed down the canyon.

But even an eroding range will gradually recover if grazing is discontinued or properly controlled. Manti Canyon, a few miles to the southward, may be taken as an example. Floods had occurred in 1888, 1889, 1893, 1901, 1906, 1908, 1909, and 1910. No serious flood is reported previous to 1889. Sheep grazing had begun in the section five or six years before and had gradually reduced the vegetative cover until the flood of 1888 broke thru and developed gullies. Thereafter, deluges were frequent until all stock was excluded for the 5-year period from 1904 to 1909, during which time the plants recovered sufficiently to absorb most of the water that caused the flood of August 1909. Manti Canyon was barely flooded, whereas Ephraim and Six-mile Canyons in the path of the same storm and

\(^{10}\)U. S. D. A. Dept. Bul. 675, pp. 24-27.
Fig. 8. In June, 1918, a heavy storm on the overgrazed mountainous range back of Mt. Pleasant, Utah, caused a flood that ripped a great wash directly thru town and destroyed much land.

receiving the same amount of rainfall were seriously eroded. Great quantities of soil and rock were thrown out into the valley, completely ruining some farms. Mt. Pleasant had the same experience in June, 1918. Canyons under protection, that is, where grazing was controlled, were not flooded, but the continuously grazed canyon of Mr. Pleasant poured a river of water, mud, and stone directly into the town and across apple orchards and fields of alfalfa, grain, and bluegrass. A gully from three to twenty feet deep was ripped thru town and across some of the best land of the section. Much of the best farming land covered with boulders and mud from this flood will never again be cultivated.

The grazing control and timber management cannot prevent all floods; a combination of the two might eliminate most of them and materially decrease the power of those they cannot prevent.

Water Monopoly.—Throughout much of the arid region, suitable watering places for animals are scarce and have become more so as percolation has decreased due to the increased run-off. Struggles for control of water holes have occurred ever since the days of Abraham and Lot. If a man controlled the only watering place in a region he held the region so far as grazing was concerned. The first aspect of this has already had attention in the paragraph on range wars.
Thruout Utah are many examples of isolated watering places that serve large areas. In western Boxelder, Tooele, Juab, Millard, Beaver, and Iron Counties and in much of Nevada are large areas, often several miles in extent, with only one water hole. For example, Fish Springs is many miles from any other surface water. In Wah-wah Valley of western Beaver County is another spring that absolutely controls the grazing for six to nine miles in every direction. Eastern and southern Utah have many similar watering places.

What is true of Utah is true of the arid region as a whole. In the southwest corner of Wyoming is the Uintah-Rich Grazing Reserve, where one concern bought up alternate railroad sections and ten or twelve "forties" of public land with all the water that was not on the railroad lands. This arrangement allows almost complete grazing control of a tract of almost fifteen by thirty miles, half of which is public land.

Let us take one part of the state of Nevada as another example. Ranching began on the usual scale, that is, many small ranchmen took up the drainage area and valley of a stream. Each owned a tract of land with some water for stock and irrigation. All ran stock on the public domain. Everything went well until a "tramp sheepman drove his band into the section". One ranchman found that feed he had counted on had been eaten off. He crowded his neighbor who in turn trespassed on the range rights of another neighbor. Strained feelings and finally shooting of animals and of several men resulted. Next year one ranchman bought up the claim of a neighbor and a year or two later that of another. As time went on he acquired land at prices beyond any reasonable hope of returns, but his land now held all the watering places of his part of the valley. Other ranchmen did the same, and shortly a half dozen of them occupied the whole drainage area. "Tramp" stockmen could not come in for feed on the open range, because there was no place to water their stock. Thus it happened that the necessity of protection gave rise to large ranches having a monopoly on watering places. They owned 5 to 10 per cent of the land, but virtually owned also the 90 to 95 per cent of public range, which was useless without the "key" land which the ranchers actually had under fence.

Such a condition promoted the ownership of most of the best land by a few corporations instead of by many farmers. One reasonably typical ranch is eight miles long by about three miles wide and in addition controls some seventy square miles of
public domain. Adams\textsuperscript{11} of Nevada says that all the work is done by transient laborers who have no homes, no families, no church, no school, and no ideals of citizenship. The area under irrigation could support 1500 people with good homes, good schools, and healthy social life. The land is good for farming and yet it remains as ranch meadow. As hay-producing land it is worth about $50 an acre, whereas it would be worth $150 an acre as small general farms. In spite of this it will remain as ranch property on account of being "key" land in a water monopoly which gives the owner control of several times as much public domain. Some Nevada ranches are much larger than the one here cited as an example.

With about the same resources as Nevada, Adams explains that Utah supports five times the population, and that it is a state of homes, schools, and stable citizenry. In Utah are more than 25,000 farms of about 190 acres each as compared to 3000 in Nevada of about 750 acres each. In Nevada only 19 per cent of the land area is held in allotments of less than 500 acres each; in Utah 82 per cent of the land is so held. Unfortunately, there is at present a tendency toward corporate ranching in Utah which needs attention. The remedy is a system of control for the public domain such as will make the stockmen feel safe in their rights. Only necessity compels such an expensive practice as water monopoly.

Wild Horses.—The old Spanish missions in Mexico, New Mexico, Arizona, and California kept great numbers of cattle, sheep, and horses. After the Mexican government took these out of the hands of the church in 1836, the missions soon broke up. The Indians wandered off and lived as previously; the cattle and sheep were butchered or were killed by wild animals; the horses, however, multiplied and became virtually wild, "feral" we say, for tame animals that have run wild. They spread rather largely over the West and Southwest. In many localities they became so numerous as to eat feed enough to support many cattle. They were once especially numerous in southwestern Nevada and adjacent parts of California.

These horses were small, cleanly built, and wiry. Their great endurance and clean strong legs made them splendid as breeding stock for saddle ponies. The larger ones were really fine ponies themselves, but most of them were small (700 to 900 pounds), very hard to catch, and extremely hard to break. Thousands of them have been shot or poisoned by stockmen. In western Utah about 1900 and just before, they were really numerous. They ranged south of Great Salt Lake, in western Tooele, Juab,

\textsuperscript{11}American Journal of Sociology, Vol. 22, pp. 324-351.
and Millard Counties. Ranchers and farmers occasionally caught some by running them down with relays of riders; more success usually accompanied the building of spreading fences around water holes in such a way that they could be corraled.

Then a group of semi-ruffians found a market somewhere in the Middlewest, rumor says in the meat-packing plants of Kansas City and other towns, where the best were sold at auction and the others made into “corned beef”. Tho the people of Tooele, Juab, and Millard Counties only had surmises as to what became of them, thousands were rounded up and loaded into cars. The favorite method was to station men around the half dozen water holes in the region, frighten them away for about a week after which they were allowed to come in and drink their fill. They could easily be driven after they had practically foundered themselves on water. “Mustangs” are now almost extinct in this region but are great nuisances in eastern and southern Utah and parts of Arizona. Wild asses are also numerous in some regions. Control of any sort would automatically rid the domain of this trouble.

Rodents.—Stockmen all observed that prairie dogs and ground squirrels increased with almost unbelievable rapidity after the filling of the arid region with cattle. This was a great annoyance, for where numerous, they destroyed feed that might be eaten by cattle or sheep. Since their favorite feed was forage palatable to stock, the stockmen became alarmed. Recently the U. S. Biological Survey established a branch whose function is rodent control. Poisoned grain is the chief weapon. Unless a person has seen an infested area of some size he can scarcely appreciate the importance of these animals as feed destroyers. In eastern and southern Utah there were formerly areas in which hundreds of square miles seemed completely populated. During the last few years this nuisance has been considerably abated by campaigns in the most heavily infested areas, but many yet remain—certainly enough to repropagate the pests in a few years if vigilance is relaxed.

Merriam who has made a study of prairie dogs in the Great Plains reports one area in Texas where a strip 100 miles wide by 250 miles long is completely populated. On all of this 25,000 square miles, he estimated that there were at least twenty-five to the acre on the average, making about 400 million in this one colony. According to weight, he concluded that thirty-two prairie dogs eat as much as one sheep and 256 as much as one cow. Assuming this to be correct (and it at least approxi-
mates correctness), he computed that the prairie dogs in this one enormous colony ate enough to have maintained one and a half million head of cattle. This indicates what the stockman has to contend with from these pests. Our ground squirrel is considerably smaller than the prairie dog, but this only means that a few more are required to eat down the feed. Estimates for whole regions state that from 10 to 50 per cent of the feed is destroyed by these pests.

Fig. 9. Cattle congregate at watering places and completely destroy the vegetation.

Many persons wonder why there was such a rapid increase of these small rodents as cattle increased. The answer is not hard to find. As sheep and cattle ranching became permanent, the stockmen waged a relentless war against wolves, coyotes, and snakes. Badgers, owls, and hawks were likewise shot at sight. These animals are the natural enemies of prairie dogs, ground squirrels, field mice, gophers, and rabbits and held them in check. All rodents multiply rapidly if undisturbed. When their enemies were practically annihilated, they were left free to rear their prolific families with only a low death rate. Nature has such a complete check-and-balance system that interference with it may bring unexpected results.

Poisonous Plants.—There was another unfortunate coincidence. As the ranges became depleted and food scarcity was made really apparent, cattle began to die whenever they grazed in certain localities. The animals were often found close together, several in a place. They were badly swollen; and when discovered just before death, they showed symptoms of having been poisoned. Cattlemen accused sheep herders who were astounded, but yet unable to account for the sudden death of the cattle. When sheep also began to die, the sheepmen felt
that it was certain the cattle owners were guilty. It was observed that particular gullies were the scenes of such poisonings. Bait was suspected, but after a time, the general occurrence of one or of a few species of plants was correlated with these baffling losses.

It is now known that as a range is depleted and the good forage plants become scarce, other species that can survive these unfavorable conditions invade the hitherto occupied soil area. Constant, heavy grazing prevents the seeding and reproduction of the most palatable plants. As the most desirable forages become rarer and rarer, coarse unpalatable species come in. Partly because they are unpalatable and are therefore allowed to produce seed and partly because they can survive in poorer soils, these plants replace the more edible ones. Among the coarser and less palatable species are a dozen or so that kill cattle or

Character of forage and estimated capacity of the western grazing areas of the United States*

<table>
<thead>
<tr>
<th>Area</th>
<th>Length of Season (months)</th>
<th>Area to support a cow (acres)</th>
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<tbody>
<tr>
<td>Northern Great Plains</td>
<td>5 to 8</td>
<td>15 to 25</td>
</tr>
<tr>
<td>Southern Great Plains</td>
<td>5 to 10</td>
<td>15 to 25</td>
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<td>Central Rocky Mountains</td>
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<td>New Mexico-Arizona Mountains</td>
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<td>West-central and northwestern Montana</td>
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<tr>
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<tr>
<td>Northern Rocky Mountains</td>
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<tr>
<td>Wasatch, Uintah, and Wyoming Mountains</td>
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<tr>
<td>Northeastern Nevada, southern Idaho, and Central Oregon</td>
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<tr>
<td>California-Oregon Mountain Valley</td>
<td>6 to 8</td>
<td>10 to 25</td>
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*For the public domain left, the carrying capacity has been estimated as shown above.

sheep, or both, under certain circumstances. The great increase in the number of poisonous plants was merely a symptom of overgrazing. The fact that they were poisonous was strictly accidental, but nevertheless disastrous.

On well-preserved ranges poisonous plants do not become widespread or numerous, nor do animals eat those that do occur. As a group, the poisonous species are so unpalatable that they are seldom eaten unless the animals are extremely hungry. Now, it is commonly recognized that mismanagement of the range and the stock is the chief cause of loss due to plant poisoning. The sin of "free grass" has again in this case brought its own chastisement. Nature abhors naked ground; she prefers to bear luscious forage, but if not so allowed she will have coarse and unpalatable species, even though they be poisonous.

Just as poisonous plants have come in because the soil has been rendered unproductive by overgrazing and erosion, just so will they be replaced by healthful forage when proper grazing control permits a slow recovery of the range.

**ADVENT OF THE DRY-FARMER**

If there was one thing more than another the grazier dreaded, it was the settler. Most men seek land and strongly desire to enjoy an equity upon it. Just as farmers flowed into Ohio, then Indiana and Illinois, then Iowa and Missouri, so they flowed into Kansas, Nebraska, and Dakota. About a third of the way across these states, however, the climate becomes noticeably drier—perhaps it is more accurate to say that periods of drought come more frequently and are more prolonged. In this region crop growing was tried in the "seventies" but drought frightened out the majority of the land owners. Then came a period of several seasons of heavy rainfall (1880 to 1886) which was very convenient for real estate dealers who were telling—yes, broadcasting—that as the country was plowed and sown rainfall increased. They were so fortunate in the rainfall that people were converted. In New England and New York people had a fever for investing their savings of few hundred dollars in real estate mortgages on Western lands. This whole situation is described so well by Newell\(^4\) that an extract which follows is allowed to explain the situation.

\(^4\)Irrigation (Crowell), pp. 367-370.
and of the ruin wrought by lack of knowledge of the facts, was the speculation in Western mortgages, which affected not merely the plains region, but also citizens resident in all parts of New England and the East. As the rain-belters marched triumphantly westward, they found that their movements were facilitated by companies formed to place loans and take mortgages on real estate. The profits of these loan agencies became so great that large numbers of them were formed, and competition for business became so keen that ordinary prudence was thrown aside, and the settler no longer sought for a person to make small advances of capital by which he could procure tools and seeds. No sooner had he located than rival agents hunted him up, to bid against one another for the privilege of placing a mortgage upon his farm. These mortgages, being for a few hundred dollars, were then peddled out to small investors throughout the country, being purchased by schoolteachers, clerks, and mechanics, who had laid up a small amount of money and were seeking the largest possible interest.

"Although the crop from one of these farms would, in a year of abundant rainfall, pay off the mortgage, this was not done, because of the desire of the settler to purchase more farm implements or obtain additional land; and when a series of dry years came and no crops were had season after season, the land owner, appreciating that the mortgage and interest amounted to more than the farm was worth, simply abandoned everything, and thus whole counties were practically deserted; about the only inducement to maintain the county organization being the fees obtained by the officials in connection with the mortgage business. This business has continued because of the fact that Eastern mortgagees, not knowing the true conditions, have often foreclosed, or transferred their interest, or continued to pay taxes in the vain hope that the land may some time be worth what has been loaned.

"It should not be assumed that everyone has left the subhumid region; on the contrary, among those who have tried their fortunes there are some who have clung with great tenacity, and who have been able to adapt themselves and their methods of farming to the conditions. They have introduced irrigation or have practised tilling of the soil in such a way as to conserve the moisture, and have usually been able to cut and stack sufficient hay to maintain their cattle throughout the short winter. The vacant public lands and the abandoned holdings about them have furnished ample grazing for small herds, and by planting sorghum and hardy varieties of small grains they have been sure of a fair return for their labor. When the years of abundant rainfall occurred, they have sometimes been able to secure a large crop of wheat, or even corn, whose value has reimbursed them for all of the previous outlay.

"These sturdy pioneers have sometimes displayed great ingenuity in utilizing the resources about them; such, for example, as seen in the construction of homemade windmills. By means of these mills water has been pumped to the surface, held in small reservoirs, or dams have been built across ravines, impounding storm waters. The experiments and success attained have shown that it is possible for farmers of a high order of intelligence and perseverance, not only to make a living, but even to secure a competence, in this region of uncertain rainfall".

Here we see the true relation of dry-farming in the arid region to agricultural practice as a whole—hardy grain and forage crops where consistently possible by means of scientific dry-farming, some irrigation (by pumping if necessary), and the remaining part of the land used as pastures for grazing. Out-
side the true farming sections any one of these phases by itself is not likely to be economically permanent. Dry-farming alone, except in a few favored localities, and grazing alone are too precarious; outside of reclamation projects too little additional land will ever be irrigated for irrigation to be used for anything more than a method for insuring the grazing-dry-farm homestead.

Utah.—Every part of the western United States had a fling at dry-farming tracts that are too dry, areas where the word "dry-farm" is heavily accented on the first syllable. In the Mountain States rainfall is much more equally distributed from season to season than it is on the Plains, but Utah has years of drouth and years of somewhat more rainfall than usual. Even the best dry-farming sections of the state run on narrow margins in the seasons of somewhat less rainfall. Some parts of Utah are consistently safe, others good for a time and then too poor to withstand drouthy seasons, and still others too uniformly dry for crop production to be attempted even where the soil is very rich, as are many of our well-drained arid soils.

![An abandoned dry-farm entry growing up to Russian thistles. Escalante Valley, Utah. (Courtesy L. M. Winsor).](image)

About 1912 a California real estate concern exploited about five hundred families into the Escalante Valley between Modena and Milford. The dry-farm specialist of the Utah Agricultural College Extension Division went over the district, met with the people, and advised them to sacrifice their investments and move while they could. This greatly aroused the settlers who had apparently been prepared by the real estate concern for this very happening. They accused the specialist of being hired to keep everybody except Mormons out of Utah, and they explained in no uncertain tones that this principle of Mormonism was now
doomed. Reason did no good; they remained as long as they could, that is, as long as their finances permitted, and then went out without a dollar. Some drove skinny horses as they left; some walked; some "bummed" rides and several died, broken-hearted, and financially stripped.

About the same time thousands of acres of land in Rush Valley, Tooele County, were broken and sown to fall wheat. A small crop was harvested one year, but this was quickly used up in the next drouth-struck season. Another dry season followed, and still another and another. The land is now slowly being revegetated by native plants.

It seems to a casual observer that people would gradually become acquainted with the conditions and be able to brace themselves against land booms, whether natural or promoted. The instinct of acquiring property, however, is strong and certain things can be learned only by trying. Perhaps everybody wishes to get wealth or property easily, and seeing a few do it, cannot resist. Fake stocks are sold year in and year out, the same men "biting" over and over again. This condition applies to land as well, and now the same Escalante land is being sold again, this time as choice irrigated farm land. Water was discovered underground, and pumping for a few feet is cheap. The California real estate people are talking 10,000 acres "to begin with", when the state geologist says the total maximum by any method of honest computation is water enough for not more than 2000 acres, possibly much less.

Is there not some way to stop this wholesale "fleecing" of settlers by putting them on impossible land? Wisconsin has an organization, the purpose of which is to see that prospective settlers are not exploited on to land that is known to be impossible of economic development under present conditions. Who shall say what land is possible—real estate agents or a staff of scientific government specialists?

Montana "Triangle".—Many influential citizens urge that this condition cannot be controlled, that it is temporary and will "run down". They say the examples of recent years are small, just the dying embers of an already spent fire. If such were the case we could let it pass away. Montana is at the present time experiencing the after-effects of boom involving ten or twelve million acres of dry-farm land. This is perhaps a case principally of natural rather than artificial promotion, but there were without doubt "locaters" employed.

The history of the "Triangle" in Montana\(^\text{15}\) is a typical case.

\(^{15}\text{Montana Ext. Serv. Bul. 66 (1923)}.\)
This area lies in a great three-sided tract with an apex near Great Falls, another near Havre, and the third near Cut Bank. There are 18,000 farms and about seventy-five towns in the area which includes all or part of eight counties and in total size contains fifteen to eighteen million acres, an area equal in size to half of Iowa or one-third of Utah.

Previous to 1907 the country was public domain used principally for cattle grazing. There was no part of western America where the cowboy more nearly had control. From 1880 and 1900 there was practically no industry except cattle ranching. Montanans brag that this was the wildest of the "wild West". It was almost completely grass-covered and a fine cattle-ranching country.

In 1907 homesteaders began settling on the public lands. The boom came during the period 1909 to 1911, due probably to the fact that splendid wheat yields were obtained in 1907, 1908, and 1909. Visitors were favorably impressed with the great tracts of open plains, with the ease of breaking, and with the high yields. By 1914 practically all the land desirable for farming had been filed on. Other land remained, but was not really agricultural land; yet settlement went on. In 1911 there were about 300 entries for homesteads; in 1912 about 2700; in 1913, 5100; in 1914, 4600; in 1915, 3500; in 1916, 3400; in 1917, 7200; in 1918, 1700; in 1919, 1100; in 1920, 1500; in 1921, 1000; and in 1922, 600. This wide variation in number of entries is explained by the very high yields of 1915 and 1916 when farmers obtained 30 to 55 bushels of wheat to the acre even tho much of
it had been seeded on stubble of the previous year. About this
time the Havre substation was begun; here acre-yields of
wheat have run as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Acre-yield</th>
<th>Total Rainfall</th>
<th>Season Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1916</td>
<td>49 bushels</td>
<td>20.7 inches</td>
<td>14.0 inches</td>
</tr>
<tr>
<td>1917</td>
<td>6 bushels</td>
<td>13.7 inches</td>
<td>4.0 inches</td>
</tr>
<tr>
<td>1918</td>
<td>8 bushels</td>
<td>10.0 inches</td>
<td>5.3 inches</td>
</tr>
<tr>
<td>1919</td>
<td>3 bushels</td>
<td>8.9 inches</td>
<td>4.1 inches</td>
</tr>
<tr>
<td>1920</td>
<td>10 bushels</td>
<td>14.1 inches</td>
<td>9.4 inches</td>
</tr>
<tr>
<td>1921</td>
<td>10 bushels</td>
<td>13.0 inches</td>
<td>7.9 inches</td>
</tr>
<tr>
<td>1922</td>
<td>14 bushels</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

40-year average 13.54 8.51

During the first few years there were practically no weeds or pests. By 1919 the country had become completely overrun with Russian thistle. In 1920 thousands of acres of wheat were ruined by grasshoppers and cutworms. Bankers and business men had encouraged farmers to borrow on their land and stay. By 1920 practically nobody had anything either to lend or to give for security. The government made some emergency appropriations, but the great drop in price in 1920 was too heavy to be borne. A general exodus set in; by 1922 about 50 per cent of the farm mortgages had been foreclosed or else were in the process of being foreclosed.

ADMINISTRATION

From the Atlantic coast to the Missouri River, crop-growing came in and completely ousted grazing as an industry based on public land. Wheat has been the favorite pioneer crop, later to be partly replaced by diversified crops and livestock. Everywhere in eastern United States there were these periods: (1) grazing, (2) one-crop farming, and (3) diversified agriculture. Sometimes the single crop is wheat or corn and sometimes cotton, but whatever it is, it is a cash crop and sooner or later meets its doom as a lone crop in the form of an insect pest (such as cotton boll weevil and corn root louse, for example), a plant disease (such as black stem rust), or a weed (such as Russian thistle in the northern Great Plains).

The temporariness of grazing in any one locality caused the people and the Government both to regard it as a short-lived industry that would disappear shortly. Accordingly, no effort was made to regulate the use of public land for grazing; any regulations made for the East would have been rendered void before they could have been operative, on account of the land's
passing rapidly into agricultural use after only a few years. Consequently, the whole thing was regarded as a most transitory phase of agriculture which would almost at once be replaced by crop-growing. No official attention was given to such a condition—indeed, could not be given for the condition disappeared almost immediately. When the arid regions began to be settled it was natural that grazing should be treated in the same way. The spirit of "let her go, she'll soon run down" was merely passed a little farther west by each generation. The advent of dry-farming on the plains made everybody feel that the only difference between the grazing industry of the West and that of the East was the kind of farming that was to succeed it. However, the failure of even dry-farming in the arid region except in a few favorable spots, has left us with a grazing industry now recognized to be permanent but with no national policy. Nor is this remarkable in view of the history of the industry.

NATIONAL FORESTS

By 1891 it had become clear that free and unrestricted rights to cut timber from, and to graze animals on, the public domain had brought about several undesirable conditions. Our timber supply was no longer thought to be completely inexhaustible as it once was; the best timber was either getting scarce or was in inaccessible places. Floods had become woefully common in certain regions where timber had been cut off the watersheds; forage on the grazing ranges was badly overgrazed, at least near the watering places; in the irrigated regions the streams carried great quantities of silt, sand, and gravel which clogged up canals and farm ditches; and many towns, dependent on streams for their culinary water supply, found the water no longer clear but muddy a large part of the year, and often badly tainted with manure washed in from nearby bed-grounds. Some of these conditions were merely unpleasant, but others were unsanitary, while still others were a menace to public welfare, as was the destruction of timber and watersheds.

Beginning in 1891 Congress set aside Yellowstone Timberland Reserve as the first part of the public domain to be reserved from free and unrestricted use. At intervals from 1891 to about 1911, forest reserves were made principally in the West, for most of the land in the East had already passed out of Government hands. By 1921 about all watersheds that had not already become private or corporate were set aside in the reserves and designated as National Forests. Altogether in the eleven far-western states, the forests comprised about 150 million
acres. Most of this land is so mountainous in nature and at such high altitudes as to be unfit for crop-growing. Some forests or parts of forests are set aside as game preserves and some primarily as national recreational centers. All National Forests are open to grazing within limitations, with the exception of the strictly controlled game preserves and recreational parks.

**Grazing Control.**—The National Forests are so handled as to give the officials nearly complete charge as to the kind and number of animals permitted to graze on a given forest, the time at which they are turned on, the time removed, their distribution, whether grazed alone or along with other kinds of animals, and who should be given the privilege of grazing his animals on the forest. In the few years immediately after 1900 our National Forests not only increased most rapidly but evolved the main features of their policy. President Roosevelt and For­ester Pinchot were probably more responsible for this than were any other men. Their official positions gave men of vision opportunity to perform a great public service.

Control of grazing was not sought at the very beginning, but it soon became manifest that this would be one of the important problems. After 1900 there was a systematic effort to solve these problems and to protect the most seriously run-down watersheds. One example will show the method of control. In 1902 and 1903 the mountains east of Sanpete Valley were set aside as the Manti National Forest. Serious floods had occurred in 1888, 1889, 1893, 1896, and 1901. In 1904 grazing was completely prohibited on about 9000 acres in Manti Canyon. By 1909 there had been sufficient improvement to warrant permitting 300 head of cattle to graze on the restricted area. In 1909 heavy storms struck the forest and deluged the Six-mile and Ephraim Canyons with severe floods, whereas Manti Canyon just between was barely flooded. In 1910 a similar storm did great damage in the town of Ephraim but none in Manti, even tho the storm was as heavy in Manti Canyon. This experience has been repeated often enough other places to warrant the conclusion that badly injured watersheds will partly recover in a few years.

In order to facilitate control of the forests, officials in charge require stockmen who wish to range cattle, sheep, or goats on a given area to make written application as to number and kind of animals. To begin with, resident farmers were allowed first privileges with larger stockmen next in order so far as the

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16U. S. Forest Service Bul. 91, p. 7.
ranges could accomodate the animals without endangering the forest. Beyond this limit, grazing permits were denied and the numbers reduced. Small fees are charged to pay for control and supervision. These are much smaller than pasturage rentals and carry with them insurance against competition from extraneous sources.

**Attitude of Stockmen.**—At first stockmen resented this form of control and considered it an infringement on their personal rights to “free grass”. In 1903 the Public Lands Commission gathered information as to the condition of public grazing lands. Among other forms of investigation, a questionnaire was sent to stockmen in the West, asking them to answer a series of questions regarding the condition of their range, its management, and the advisability of extending the permit system to the remaining open range. About 1400 replies were returned with complete enough answers to permit tabulation. The distribution of the return answers was: Arizona, 74; California, 104; Colorado, 163; Idaho, 112; Kansas, 26; Oklahoma, 10; Montana, 158; Nebraska, 55; Nevada, 35; New Mexico, 130; North Dakota, 30; South Dakota, 55; Oregon, 88; Utah, 121; Washington, 23; and Wyoming, 216. Of these, 961 reported that the carrying capacity of their ranges had diminished during the few years immediately preceding, and 276 said they had increased in capacity. Of the 961 who reported decreased capacity, 752 said the chief contributing cause was overgrazing. Of the 1400 replies returned, 1005 reported the sale of their farm products to be mainly or partly dependent on range stock; 532 favored the development of a system of private pastures and 353 others some form of community grazing allotments. Most striking of all, however, were the answers to the question: “Do you favor Government control of the ranges under reasonable regulations?” In all 1091 answered “Yes”, 183 answered “No”, and 127 failed to answer. This shows that stockmen had been almost completely won to Government regulation after having seen it tried for a few years.

Besides the practical phases of control, National Forests had afforded opportunity for research in grazing problems. These had begun in Texas in early days and later extended to Arizona. Recently some rather thoroughgoing studies have been made in New Mexico, Arizona, Oregon, Washington, and California, but chiefly in Utah on the Manti National Forest where the Great Basin Experiment Station is located near the head of Ephraim Canyon at an elevation of 8700 feet. A few of the principal

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17U. S. Forest Service Bul. 62 (Senate Document 189), p. 11.
findings of this research are that grazing control reduces floods and erosion; that the vegetative cover may be completely grazed and yet allow the carrying capacity to increase; that too early grazing is most serious; that the presence of weeds and poisonous plants is due to deterioration in the soil; that tree growth is heavily damaged by close grazing; that there is at present little hope from reseeding to imported plants; and that fences are of almost unlimited value in feed utilization, in protection from predatory animals, in decreasing erosion, in timber protection, and in the development of suitable watering places. Other findings too numerous even to name have each contributed something to the question of grazing control or administration of the public domain.

The Report of the Public Lands Commission, already cited, recommended that a system somewhat similar to the present system be instituted for the unrestricted public domain. The recommendation included a plan for land classification and administration by districts with the Forest Service in general charge but with considerable powers residing in local users of the areas designated. In spite of official urging and local sanction from the stockmen nothing has as yet been done, tho twenty years have elapsed. Lack of appreciation of the great importance and necessity of control on the part of state officials and Congress-

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men has been a great retarding factor. Education in this respect has recently made great strides both by way of investigating various systems of control and of disseminating information.

As compared with the general failure of free grazing in western United States, there are four American systems of grazing control, all applicable in a general way, that have succeeded at least measurably. These are: (1) National Forest permit system, already discussed briefly; (2) the Texas combined lease and sale system; (3) the Wyoming leasing of state-owned lands; and (4) the railroad lease system. In addition, the Australian lease system presents still another angle that seems worthy of consideration. Let us examine each of these systems of control to see if a general plan of handling our public domain cannot be discovered, or at least tentatively suggested for further consideration.

LEASING AND FENCING IN TEXAS

Previous to 1883, Texas had run the gamut of the grazing industry. Under “free range”, overstocking and premature grazing had run practically to maturity; watering places were completely denuded for miles around; competition for feed and consequent feuds and range struggle had created a virtual state of guerilla warfare in many sections; rustling was common; heavy losses resulted from severe winters, drouth, poisonous plants, and general lack of inducement to improve the range land by developing water, building vats for tick control, introducing better stock, and practically all other things for which men invest their capital under favorable tenure. Some ranching concerns found fences so advantageous in herding, feed insurance, reduction of rustling, and increasing the calf crop that immense tracts were fenced without authority. Uncontrolled fencing without legal authority was thought dangerous but was deemed so helpful if properly legalized as to bring about revision of the laws related to fencing.

In 1883 the whole area of publicly owned land in Texas was organized under new land laws. This was possible because the state retained ownership of the land according to its annexation agreement with the United States. These laws have been revised several times in order to make enforcement more feasible or more effective. In 1901 the laws covering both disposal of public lands and fencing reached a form nearly enough perfect to be operative, and with only minor revisions they stand today. The principal provisions of the Texas law follow:

(1) Lands are classified as agricultural, grazing, and timbered but are subject to reclassification at any time.
(2) Sale was encouraged on all lands by reducing the price of grazing lands from $2 to $1 an acre and of agricultural lands from $3 to $1.50 an acre.

(3) At first a man could purchase one section, but now four sections—not more than two of which may be agricultural.

(4) All lands which in the opinion of the commissioner of the land office are not in demand for settlement may be classified as lease lands and, if in a region very unlikely to be demanded for settlement in the near future, as absolute-lease lands.

(5) Lands not in the absolute-lease district are open to settlement at any time except (a) when the lessee has put on the land improvements amounting to $200 a section, (b) when the lessee has made beginnings of a permanent settlement on the land, or (c) if his claim is not more than one section.

(6) In the absolute-lease district land is open for purchase only for sixty days at the end of each 5-year lease, at the end of which the previous lessee has a thirty day's preference right. The lessee also has sixty days of prior right in which he may purchase.

(7) All improvements on leased land are personal property of lessee.

(8) Leases are granted on application to approved highest bidders, for 5-year periods with a minimum rental of 3 cents an acre, rental payable yearly in advance and lease subject to cancellation when rental dues are sixty days past due.

(9) It is illegal to fence public land not properly leased, but full fencing privileges accompany the lease.

(10) Purchaser must not be in collusion to buy for other party or corporation.

(11) Leases may be in any amount approved by commissioner and may be sub-leased, provided leasehold of original lessee is not reduced to less than ten sections.

(12) Previous to the granting of a patent the purchaser must put improvements on land worth at least $300 and must have lived on it for three years. If land purchased is in more than one piece, the additional lands must be within a radius of five miles of land occupied by purchaser.

It is significant that thirty-five years of "free range" converted most people to the idea that this was bad. A few stockmen moved into Arizona, New Mexico, or Colorado following the lease laws, but most of them remained to purchase or to lease. After thirty-five years under the lease tenure, it is doubtful if any substantial stockmen would consider a return to open range. In 1904 the number of cattle on the ranges of Texas was about double what it was in 1884. During the last twenty years there has been further increase. Rustling disappeared with the advent of fences and of more orderly society. There are no known feuds and the quality of cattle has been much improved.

LEASING IN WYOMING

When Wyoming was admitted as a state in 1890 she was allowed about four million acres of land, three million of which
was composed of isolated sections (Nos. 16 and 36 in each township in the state) and about one million of which is in varied locations in contiguously larger areas. All except about 530,000 acres of this land was school and educational land. Wyoming lacks the advantage Texas has in being able to control the entire public domain. State-owned lands constitute only a small percentage of the public domain in Wyoming.

The land laws passed in 1891 and amended several times since set the selling price of state land at $10 an acre and provided that not to exceed 640 acres of school land may be leased by any one person; there is no such limit on the non-educational state-owned land. On account of $10 an acre being considerably above the price for ordinary range land, none has been sold. The rental fees are 2 1/2 cents an acre for land without streams or good watering places, 5 cents an acre for land with stream or good water place, and 25 cents an acre for irrigable land. Leases may extend for five years and are subject to three preferential lease periods, making twenty years of reasonably secure tenure. In general the Wyoming lease laws are patterned after those of Texas, but an effort at improvement was made with view to prevent the excessively large corporate leases of Texas and to handle them in such a manner as to promote welfare of the community. For example, a large transient stock company might outbid smaller local owners. In Texas the land would go to the highest bidder, whereas the Wyoming Land Board reserves the right to refuse bids that do not seem to be for the best good of the county or community, and it would probably thereby consider the moral right of the resident owner and probably grant him the lease.

In practice about 60 per cent of the state-owned land has been leased for an average rental of between 4 and 5 cents an acre. The income has been about $100,000 a year, with all leases for five years. The size of leasehold on educational land has averaged 575 acres each and on non-educational land, where there is no limit, about 1000 acres. In 1902 there were 4005 leases, of which 309 were in non-education land. Of the 309 leases, 245 were for less than 1000 acres with 64 for from 1000 to 34,000 acres. Only six, however, were for more than 5000 acres. The 40 per cent of land not leased lay chiefly in isolated single sections that were so located as to be too small or otherwise impractical as unit leaseholds.

LEASING RAILROAD LANDS

The Northern Pacific Railroad just previously to 1904 leased considerable land in the State of Washington. The land grant
for the Northern Pacific consisted of all the odd sections for fifty miles on either side of the right of way, which land was for years used as public grazing land by both sheepmen and cattlemen who paid nothing for it. After several years of this treatment the land had become badly overgrazed and seemed to have little sale value. The railroad company had tax assessments and other expenses on the land and set about devising a method of obtaining income to cover these expenses but chiefly to bring about a recovery of the land to such a point that it could be sold.

A number of large sheep owners who had been grazing the lands scouted the idea of recovery and objected to leasing when the company proposed that plan. Cattle also grazed on the lands, but the big stockmen involved were sheep owners. Moreover, the Washington fence law was so worded that sheep grazing on unowned land except that owned by the Federal Government constituted a misdemeanor. Since the sheepmen objected to leasing, the railroad obtained an injunction against thirty of the largest owners in eastern Washington. This resulted in a meeting between stockmen and railroads at which a lease was arranged. Applications were made, and in 1896 lands were leased principally to the men who had used it previously. Cattlemen, seeing that unless they obtained legal tenure rights to part of the land they would be without range, also leased.

The railroad companies then proceeded to do likewise in the central part of the state. Here twenty-nine of the stockmen resisted by forming an organization, the members of which agreed not to lease unless the railroad would give a written contract to keep all other animals off the leased land and unless the fees were no more than taxes. They bound themselves to pay proportionate expenses for any litigation that might arise due to resistance of the lease and further agreed not to lease until a general committee had approved anything a man wished to do. The deadlock looked fast and remained so for a time, but some individual owners weakened and applied for leases. Others soon followed. By the end of 1898, 237 leases including practically all of the land had been taken.

Under the more secure tenure of the leasehold, the land recovered rather rapidly and purchasing became active. By 1904 nearly all the land had been sold and the stockmen completely converted to the idea of control or lease, as is shown by the fact in 1900 the Yakima Wool Growers' Association, to which the twenty-nine organized objectors all belonged, petitioned their member of Congress to do everything in his power to bring
about a Government leasing system for public grazing lands. As far as the railroad was concerned the leasing accomplished its purpose by bringing about a condition that caused the land to be sold and by collecting enough previous to sale to cover taxes and administration charges. The fees varied with the land but averaged $1.87 for each 100 acres, slightly less than 2 cents an acre.

Fig. 13. A shearing corral—typical of the arid regions of western United States. (Courtesy H. J. Frederick).

TENURE OF GRAZING LANDS IN AUSTRALIA

During the period of early settlement in Australia, no attention was paid to the administration of the public domain. Immense corporations grew up and took possession of the land, principally by "squatters'" privilege. Later when real home-making settlers began to come in they found all the best land "gobbled up" by the great concerns. This served to keep out settlers, the one thing that New South Wales was trying to encourage. Accordingly, laws were passed compelling the owners of the grazing animals to pay rental fees. It was expected that this would break up the "bonanza" ranches, but officials found the ranchmen merely paid the lease fees and kept the land even more complacently than before.

In 1884 New South Wales revised its land laws in such a way
that the whole situation was changed. All pastoral leases were called in by the Government and divided into two approximately equal parts, one of which was returned to the original lessee. With half the land at its disposal, the Government organized a lease system to encourage small owners to get started in the region. Provisions for purchase or lease or a combination of both were made in such a way that leases extended for seven years with renewal preferences so arranged as to make the tenure virtually twenty-one or twenty-eight years. Lessees are required to act in good faith and use the land leased. Purchases are handled in much the same manner and settlement went on rather rapidly. The general government of the Commonwealth classifies the land and the fee is fixed according to this classification, varying in amount from 60 cents a square mile for the poorest desert land to 14 cents for enough of the better land to carry one sheep. The rental is fixed every seven years, but if it is deemed desirable by the lessee an appraisal may be asked for at any time. At the end of the 7-year period, the lease may be relinquished if the lessee desires, but if he chooses he may continue for as long as twenty-one or twenty-eight years.

Certain additional features of the lease tend to make it still more attractive for the stockman. In case of prolonged severe drouth, rental fees may be held in abeyance until such a time as they can be paid, say for six months or a year, but in one protracted drouth the suspension continued for nearly three years. Any improvements put on the land belong to the lessee who may either remove them or sell to the new lessee if agreement is reached. Should it happen that neither condition prevails, then the constructor of fences, buildings, and equipment has tenant rights to them, which condition is covered by law. Certainty of tenure for a relatively long period with assurance that improvements shall not be lost has made the Australian leasehold system extremely satisfactory to individual stockmen who do not have sufficient capital for land purchase or who for some other reason do not wish to buy land. Ordinarily, a man with moderate capital prefers to lease land and devote his capital to livestock and equipment improvement. Then twenty-eight years of assured control has most of the attractions of ownership in fee simple.

As settlement extended to western, southern, and central Australia, land had to be utilized where the rainfall was much lower than in New South Wales. Much of the region is virtually desert, in consequence of which large areas are required for grazing leaseholds large enough to support a family. Several sorts of leasehold were provided, varying in size from 10,240
acres to several times that size, in fact without limit in the drier sections. The homestead lease on western lands allowed 10,240 acres for twenty-eight years and required fencing within two years. On inferior-land leases, the area is 20,480 acres and the period twenty-eight years. The pastoral lease is unlimited as to area but likewise runs for twenty-eight years, except those covered by the special Western Lands Act of 1901. By provisions of this act, the period is forty-two years with the date expiration named as 1943. The pastoral lease may be additional to either the homestead lease or the inferior-land lease, in which case it is required that the land be improved for ranching convenience, including the removal of scrub growth. Regions promising for settlement are covered by a settlement lease which requires fencing in five years and permanent residence. Under this form of leasehold the fee is extremely low, being only 1.25 per cent of the land value with improvements exempt. An artesian-well lease is conditional on the obtaining of water by this means.

Especially in the case of the poorer regions, the terms of lease are adjusted to encourage the use of these lands. In many cases the areas seem large, but when it is remembered that the aridity throughout much of the region is extreme it is apparent that the vastness is in area and not in total feed capacity. Every encouragement is needed in order to bring such lands under subjugation. Practically all of the Australian land designated as inferior is lower in its carrying capacity than any Utah lands except small areas of the very worst, such as the “Great American Desert” south of the western extension of Great Salt Lake.
Encouragement, so inflected as to bring resident settlers instead of land speculators, is freely extended. Precaution against fraud and corporate monopoly such as now exist in parts of Texas and Nevada have borne fruit in a crop of independent family units. The more assurance the Commonwealth has that the settlers will become permanent residents, the more lenient are the terms of the lease offered. Tendencies to increase the length of the leasehold and to diminish annual fees are chiefly reflections of this form of concrete encouragement to resident ranching.

As a matter of fact, the ranchers had considerable voice in the making of regulations covering sales and leases in their respective regions. Co-operative interest both in the leasehold and in the system has been achieved to such an extent that the carrying capacity of the range has improved rather than deteriorated, supplementary feed has been produced, stock water has been developed, and the grade of the animals has been appreciably improved. Rustling and similar forms of lawlessness are practically unknown, and livestock diseases are held in check much more effectively than before the lease. This filling up of the country with independent, prosperous residents, most of whom are owners of comfortable family-sized units, presents a far different picture from Nevada where water monopoly and corporate land-holding keeps out resident citizenry and creates the sociologically undesirable migratory laboring class.

DISCUSSION

The examination just made points out that in several cases there has been successful management of a public domain similar to that in Utah and other western range states. The leasing and fencing control in Texas, the leasing of Wyoming state-owned lands, the short period of leasing Northern Pacific Railroad lands in Washington, and the permit system in National Forests all demonstrate that more or less successful control of grazing on publicly owned lands is not only possible but not excessively difficult. In Australia there is in vogue a system of leasing

Fig. 15. A long-established pioneer home where unfavorable conditions make it difficult to accumulate wealth.
areas of land that vary in size in accordance with the quality of the land and the aridity of the region. Long leases are common in Australia, but in the various parts of the United States where leasing of public lands has been practiced the period of the lease is usually five years with preference rights for the occupant. In Texas a sale provision operates in such a way as to encourage purchase of the land and settlement on it.

Since the present method of free grazing on the public domain has been accompanied by calamitous consequences, this question now presents itself: What concrete revision is to be sought? Many are prepared to answer off-hand in favor of a certain system that each has evolved in his own mind or that he has borrowed from somebody else. The writer has his personal convictions, but these do not agree throughout with convictions of other persons better informed. On this account, it seems more opportune for the present to outline definitely the sorts of suggestion that have been made by men who are thinking on the problem, and then to state the apparent advantages and disadvantages of each. It may be that the time is not yet ripe for urging definitely any one of the plans, but it is without doubt high time that the men who hold at their disposal the destiny of our public domain, should take the matter into serious consideration.

Without holding too religiously to the details of any one plan, the following seem to deserve close study and a thoughtful weighing of relative merits:

(1) Federal leasing system, similar in a general way to that of Texas, that of Wyoming, or that of Australia.

(2) Federal permit system, similar in a general way to that now in operation on the National Forests.

(3) Federal control of a sort that will classify lands and encourage settlement on all except a small percentage not capable of becoming successful privately owned ranches. This assumes a continuance of the permit system on the present National Forests and an extension of the same, or of a similar, system to a small percentage of public domain that had best remain as winter range.

Federal Leasing.—Leasing has two distinct advantages: (1) governmental control without heavy burdens of administration and development, and (2) a direct income of considerable revenue. Opposed to the advantages are two disadvantages: (1) leaving the management of the land for forage in the hands of individuals, with the likelihood of temptation to overgraze, at least near the end of the lease, and (2) leasing has not brought about the really successful cooperation in the United States between the lessee and government that we are told pre-
vails in Australia and several European countries with regard to land purchase and rural credit generally. Wooton\textsuperscript{19}, whose bulletins have probably gone into this phase of the question more thoroly than any other published theses, says:

"The second serious difficulty lies in the fact that the kind of law that will suit the conditions in one region will not do at all in another place; and so far no one has been able to devise a lease law that would cover the necessary provisos and exceptions and properly localize the application of such limitations".

Wooton discusses also the possibility of a general exchange of lands between corporations and the Federal Government in order to get alternating sections, or even more widely scattered ones, into unbroken areas of considerable size. Only small percentages of our total public domain would be affected, and while consolidation would be beneficial, the difficulties of a wholesale trade of this sort would be hard to overcome. He also considers the possibility of turning all remaining public land over to the eleven range states for their control, utilization, and administration. Danger of conflicting state policies and the greater cost of administering the land in eleven systems instead of one are against this plan. Such action would increase the possibility of short-sighted policy in lieu of temporary benefit. Every state would also have the expense and danger of political manipulation to bear, and that without the protection which a national organization could afford.

**Federal Permit System.**—Practically all Forest Service officials of the United States Department of Agriculture favor the extension of the National Forest permit system to the remaining public domain. In 1903 President Roosevelt appointed a Public Lands Commission, consisting of W. A. Richards, Commissioner of the General Land Office; F. H. Newell, Chief Engineer of the Reclamation Service; and Gifford Pinchot, Forester of the Department of Agriculture. F. V. Coville, botanist for the Department of Agriculture, reduced to writing a report on the various systems of leasing or other control and worked out the details of a plan for a suggestive system\textsuperscript{20}. This plan is rather non-partisan and has much to recommend its general features.

The principal provisions of the plan may be briefly summarized as follows:

1. Public lands of the arid states are to be occupied for grazing under Federal permits only.
2. The public land is to be classified into lands suited for settlement and those suited only for grazing. Irrigable lands not likely to be irrigated in the relatively near future are to be classified as grazing land.

3. Lands suited for settlement are to be grazed under annual permits, but grazing land is to be handled under 5-year permits.

4. Long permits of ten or fifteen years may later be allowed on land which subsequent experience shows to be unquestionably fit only for grazing.

5. It is definitely recognized that 160-acre homestead claims, and also the later enlarged claims of 320 and 640 acres, are much too small in the area fitted only for grazing. Four to eight sections are suggested.

6. All grazing land is subject to reclassification at the end of permit periods, at which time land reclassified as suitable to settlement (either farms or family-sized livestock ranches) shall be open for private filing for a short time. If not entered within time specified, the land shall be leased once more.

7. Land classified as fit shall be certified as such and no land not so specified shall be open to entry.

8. Bonafide settlers either on surveyed or unsurveyed land will have preferential right to grazing permits on lands within one mile of their homesteads.

9. Previous permittees have preferential rights for short periods at end of lease either to enter land reclassified as fit for settlement or to lease for another period.

10. Permits are liable to cancellation in case of unwarranted irregularities.

11. Payments for permits are to be made annually and the funds received to be used for administration and reclassification, with excess income to be used for development of the political unit wherein land so handled is located.

12. The plan also recognizes the likelihood of certain areas not being suited to individual permits. A group, or community, permit arrangement is suggested.

Privately Owned Ranch Units.—So far only one strictly ranching area has been analyzed in sufficient detail to show its composition. In southwestern Texas, an area too dry, too rough, and too inaccessible to be used for any other purpose than grazing has recently passed entirely into private ownership and has thereby become a ranching section. This region is the Edwards Plateau and Sutton County was the area studied. It lies at the extreme southern end of the Great Plains, has an elevation of 2000 to 2500 feet and is hot and arid, its 22 inches of rainfall not amounting to enough in proportion to its high evaporation to make it as well-watered as parts of Utah that have 14 inches. The native vegetation shows it to be of the semi-desert type.

As late as 1877 Sutton County was the hunting ground of Indians, who were then removed to reservations. For a year or two white men hunted over the section for turkey, deer, antelope, bear, and buffalo. Wild mustang ponies were numerous until killed off by stockmen during the next few years, while the “law of the range” ruled the region. Stockmen drifted about with their animals until they found themselves in conflict, at

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which time they settled "range rights" by agreements that were in general respected. There was so little water in the county that the area was regarded as winter sheep range, or rather as emergency range, for there is no winter in the region. Sheep outfits would drift sheep back and forth for as long as they could subsist without water, which was sometimes a month. This region therefore resembles in all practical aspects our most desert-like areas. Some cheap wells were dug and ranching began; rustling became tremendously serious and drouth also caused heavy losses. In 1889 a barbed wire fence was erected

and was found so useful that it was followed by many others. At once graziers began to regard these as surrounding actual rights, whereas to newcomers they were "outlaw fences". Since the lease law already noted was now in effect, rents could be collected as soon as fences were built. During 1904, 1905, and 1906 all the land passed to private ownership.

At first only one section could be acquired legally, but shortly four sections were allowed. In the area only alternate sections were public domain, the railroads or absentee private interests owning the other alternate sections. A rancher would buy four sections and use the others, buying when he could or when forced to do so, out of necessity for feed. A typical case of beating the law arose in which ranchmen had their cowboys file on land and

Fig. 16. One reason why stockmen favor control. Free range on the right; privately-owned and protected range on left. Near Malad, Idaho, (Courtesy John T. Caine III).
add it to the ranch. Herein is the weak point of the Texan system for about half the land or more passed into gigantic corporate affairs, averaging sixty to seventy sections in size. By 1922 all land was privately owned, fenced with wolf-proof fences, and stocked with cattle, sheep, and goats which were supplied with water by wells 300 to 500 feet in depth from which windmills pumped the water. Many purebred stock are owned, the bulls are principally purebred and most of the cattle and sheep and some of the goats are high grades. In the county are 962,000 acres of land or 1504 sections, of which only 7.3 sections grow crops. Land classification listed 12 per cent as capable of

Table showing size of ranch, percentage of land in each size group, number of animals and number of ranches having woven-wire fence and wells

<table>
<thead>
<tr>
<th>Size group</th>
<th>No. of Ranches</th>
<th>Total No. of Sections</th>
<th>Per cent of All Land</th>
<th>Total No. of Animals</th>
<th>No. of Woven Wire Fences</th>
<th>No. of Ranches with Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cattle</td>
<td>Sheep</td>
<td>Goats</td>
</tr>
<tr>
<td>Under 1 section</td>
<td>1</td>
<td>1</td>
<td>.07</td>
<td>6</td>
<td>204</td>
<td>0</td>
</tr>
<tr>
<td>1-2 sections</td>
<td>10</td>
<td>10</td>
<td>.67</td>
<td>314</td>
<td>876</td>
<td>4,833</td>
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<tr>
<td>2-4 sections</td>
<td>5</td>
<td>12</td>
<td>.80</td>
<td>618</td>
<td>2,674</td>
<td>1,174</td>
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<tr>
<td>4-8 sections</td>
<td>25</td>
<td>146</td>
<td>9.70</td>
<td>4,510</td>
<td>35,941</td>
<td>20,278</td>
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<tr>
<td>8-12 sections</td>
<td>19</td>
<td>180</td>
<td>11.97</td>
<td>6,871</td>
<td>39,582</td>
<td>19,288</td>
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<tr>
<td>12-20 sections</td>
<td>18</td>
<td>256</td>
<td>17.02</td>
<td>10,486</td>
<td>63,884</td>
<td>19,891</td>
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<tr>
<td>20-32 sections</td>
<td>9</td>
<td>227</td>
<td>15.09</td>
<td>2,992</td>
<td>38,106</td>
<td>16,328</td>
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<tr>
<td>Over 32 sections</td>
<td>10</td>
<td>672</td>
<td>44.68</td>
<td>35,074</td>
<td>90,609</td>
<td>42,330</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>1504</td>
<td>100.00</td>
<td>67,871</td>
<td>271,876</td>
<td>124,122</td>
</tr>
</tbody>
</table>

Table showing number of working men, percentage calf crop, number of ranchers who live on ranch and in town, and the value of ranch house

<table>
<thead>
<tr>
<th>Size Group</th>
<th>No. of Ranches</th>
<th>No. of Grown Working Men per Ranch</th>
<th>Average Calf Crop (%)</th>
<th>Operators Living on Ranch</th>
<th>Operators Living in Town</th>
<th>Value of House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 section</td>
<td>1</td>
<td>1.0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>$2000</td>
</tr>
<tr>
<td>1-2 sections</td>
<td>10</td>
<td>1.0</td>
<td>92</td>
<td>8</td>
<td>1</td>
<td>525</td>
</tr>
<tr>
<td>2-4 sections</td>
<td>5</td>
<td>1.2</td>
<td>82</td>
<td>9</td>
<td>2</td>
<td>800</td>
</tr>
<tr>
<td>4-8 sections</td>
<td>25</td>
<td>1.3</td>
<td>76</td>
<td>9</td>
<td>7</td>
<td>1424</td>
</tr>
<tr>
<td>8-12 sections</td>
<td>19</td>
<td>2.0</td>
<td>69</td>
<td>6</td>
<td>9</td>
<td>1574</td>
</tr>
<tr>
<td>12-20 sections</td>
<td>18</td>
<td>2.3</td>
<td>68</td>
<td>4</td>
<td>10</td>
<td>1304</td>
</tr>
<tr>
<td>20-32 sections</td>
<td>9</td>
<td>5.1</td>
<td>67</td>
<td>4</td>
<td>3</td>
<td>3431</td>
</tr>
<tr>
<td>More than 32 sections</td>
<td>10</td>
<td>10.5</td>
<td>65</td>
<td>4</td>
<td>4</td>
<td>1894</td>
</tr>
</tbody>
</table>

growing some kind of crop but with only one-half of one per cent so cropped and 88 per cent as valuable for no agricultural purpose save grazing. There is no area in Utah equally large that is not as good for ranching as this, except the worst part of the Great American Desert and the Escalante Deseret, and possibly even these are as good if mountain lands be grouped with the flat valley floors.

The two tables show that ranches up to eight sections are 1-man size and from eight to twenty sections 2-man size, that is, a "family farm" in ranching runs from four to twenty sections. The larger ranches are corporate industries and not "farms". All farms except the one 1-section ranch keep cattle, sheep, and goats. Practically all have wolf-proof woven-wire fences and deep wells. In the case of the big ranches the operators and their families do not live on them, that is, they are "businesses" and not "homes".

Ownership makes for homes, adds to the population, but encourages corporate ranching and absentee dwelling which is bad for the land, the community, and the industry. There was a rapid improvement in the carrying capacity of the ranges and in the grade of livestock, purebred cattle being 40 per cent more profitable chiefly because fewer animals have to be kept to the section and these may therefore have more and better feed.

Conditions in that part of Utah which is still public domain seem somewhat more favorable for private ranches than does Sutton County, Texas. When mountain land is grouped with valley bottom, eight to ten sections seems sufficient to comprise a family ranch unit if the present National Forests are used for summer range and the prospective ranches for winter range and emergency feed production. Some rye for hay can be grown almost anywhere. Diversified livestock ranching including cattle, sheep, goats, and turkeys has not been thoroly tried in Utah. With ten sections to a ranch, forty million acres of public domain would support over 6000 families. Private ownership has the advantage of encouraging improvement in carrying capacity and eliminating the evils of "free range", while it increases taxable property. Its great disadvantage is the removal of control from the hands of the specially trained Federal officials to private citizens.

An interesting historical attempt to analyze the land problem of the arid region was made in 1879 by Powell. He advocated land classification and enlarged homestead pastures of four sections, provided not more than twenty acres could be irrigated.

24Lands of the Arid Region, Chapter 2, pp. 25-45.
His great vision in suggesting a method to prevent monopoly, similar to community grazing with large local administrative powers was little short of prophetic. He likewise foresaw water-right difficulties under irrigation and indicated the proper measures for some development. With a nearly clear field, the application of Powell's wisdom might have meant a far more creditable page in the agricultural history of the arid regions.

CONCLUSIONS

There seems six possible methods of handling public domain:

(1) To let it remain as open range with consequent evils.

(2) To organize a Federal leasing system.

(3) To put it under a Federal permit system somewhat similar to that of the National Forests.

(4) To turn the land over to the several states and allow them to handle it as each sees fit.

(5) To arrange for it to pass gradually into private ownership under such regulations as will aim to control method of acquirement and size of ranch.

(6) To further classify the land and handle each sort in such a manner as to permit its fullest ultimate development. This would put some under Federal leasing, some under a Federal permit system, and some in a class ready for absorption by private citizens but subject to restrictions that would prevent "gobbling" by corporate interests.

In January, 1924, the agricultural staff of the Utah Agricultural Experiment Station and Extension Service held a conference to discuss these six propositions. The conference consisted entirely of scientific workers, none of whom were Federal officials nor important owners of range livestock. The consensus of opinion was that, at least for the larger part of Utah's public domain, the Federal permit system had the most promise. This was understood to mean that desirable claims might be allowed to pass into private ownership, especially where the range land so acquired could be made a part of a farm previously shown to be capable of hay, or hay and grain, production. It was thought that the range land should be looked upon as supplementary to a home farm rather than as an independent new venture.

The author personally favors land classification and the putting of each sort of land under whichever system promises the fullest ultimate development. He believes that there is sufficient experience now available to enable an unbiased group of men not only to classify the land but to devise necessary regulations, even to prevent monopoly on lands designated as fit for home-building under private ownership. The task is recognized as gigantic but not as unsurmountable. Political and financial interests—not the physical problem, tremendous though it certainly is—are regarded as most difficult.
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