

California Rangelands in Historical Perspective

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California's rangeland was the first of her natural resources to be put to beneficial use. Long before the discovery of gold brought this state to worldwide attention, before crops planted by the colonists began to yield dependable harvests, the forage of its rangelands was providing for subsistence needs and beginning to form the basis of a reliable economy.

Livestock ranching was the first industry of California. It began on May 14, 1769—two hundred and twelve years ago—when the first Spanish colonists arrived in California (T.H. Hittell 1885). This small band of soldiers and missionaries from Mexico brought about 200 head of cattle, and nearly as many horses, as foundation stock for herds in the colony. Nourished by excellent forage of the California rangeland, the livestock thrived, providing the hardy pioneers with many necessities of life. The settlers also brought some crop and garden plants and agricultural implements. Grain, fruit, and vegetables supplemented products of the rangelands, contributing measurably to the welfare and permanence of the new settlement.

This first mission and settlement soon were followed by others. The ranching and agricultural enterprises so modestly begun were extended until gold was discovered in 1848. Ranching and agriculture have continued to increase in extent and importance. Today both are still dominant occupations in California.

For 250 years after Cortés landed in Mexico in 1519, the Spaniards moved northward and westward in North America. Colonization of California was the final step in this long period of expansion in the land they called New Spain. The expedition to begin a colony in California, in 1769, consisted of three units. The first—three ships—transported most of the colonists and their heavy equipment. The other two, leaving about a month apart, traveled by land from Lower California, bringing the horses and cattle that were the foundation stock of domestic animals for the new settlement.

It was customary for each mission to be started with foundation stock contributed by the older establishments; and each, in turn, then furnished livestock for still other missions.

However, the supply of animals in Lower California was very limited and there was no time to bring from Sonora, Mexico, the mules, horses, and cattle that were needed for the new colony. So, Captain Fernando Rivera, the leader of the first division of the land expedition, was instructed to go from one to another of the Lower California missions, taking as much livestock from each as could be spared (Palóu 1926). Starting with the royal presidio and mission Loreto, which contributed a considerable number of horses and mules, Rivera visited each mission in turn. When the livestock was assembled at Santa Mariá, the northernmost mission in Lower California, he had 140 mules for saddle and pack stock, 46 horses, and two jennies. The Mission of San Francisco de Borja contributed 200 head of cattle, most of them cows with calves. Except four head that were killed and "jerked" for food along the way, all these cattle subsequently went to San Diego.

The colonists led by Captain Rivera arrived at San Diego on May 14, 1769, with most of the livestock. We are looking at these events in historic perspective, so it is appropriate to pause and note that this herd of cattle was moved 300 miles through mostly desert and semidesert country, nearly a hundred years before cattle drives had been invented by the Texans. Those Spanish pioneers *could* get things done when they wanted to!



Tapestry "Spanish missionaries and California Indians", Serra Museum, San Diego, California.

This article is based on the author's slide presentation at the 1980 SRM annual meeting in San Diego, California. The author is an ecologist and geographer, Sacramento, California.

Editor's Note: The list of *References Cited* is long. However, since the article is of historical significance to rangelands the long list was justified for those who want to pursue the subject further. There are 36 references cited, some more than one time, but each was noted only once in the text because if all were left in they would distract the reader and make the article hard to read.

One of the ships arrived at San Diego on April 11. The second arrived on May 29. This one had been blown all the way to Panama by a storm and had lost all but two of her sailors to scurvy. The third ship was never heard from. The second land party, with Don Gaspar de Portolá, commander of the expedition, arrived on July 1, 6 weeks after Rivera. A few days later Portolá formally designated San Diego as a royal presidio of Spain.

Early Records of California's Rangelands

The first explorers and settlers in California were hardy, practical men with much experience in traveling and living in remote places under frontier conditions. They rode horses and mules, depending upon these animals for their personal safety and transportation of their effects. Their mounts had to be fed—and they did not carry hay and grain with them! They were forced to give close attention to the land, especially to the forage it produced. Furthermore, they were interested in settling the country—in finding homes. Having a shrewd ability to evaluate the country for these purposes, they sought lands that would yield a livelihood from grazing and farming. They immediately recognized that the grasslands and woodlands of the coastal regions—the part of California with which they became acquainted—were highly fertile, constituting excellent ranching and farming country.

After founding the settlement at San Diego, Portolá continued north to Monterey, where another settlement was to be begun. This expedition left San Diego on July 14, 1769, traveled overland to Monterey and San Francisco Bay, and returned on January 24, 1770—a journey of 6 months and 10 days. Three members kept diaries that have been translated into English and published. They were Miguel Costansó, the military engineer—one of the best educated, most competent persons in the New World at that time; Father Juan Crespi, the missionary priest; and Commander Portolá (Bolton 1927; Costansó 1770; Portolá 1909). These diaries are replete with comments about the forage, availability of water, and suitability of the land for grazing and farming.

Costansó described the place where the expedition camped on July 15, 1769—near Del Mar, some 15 miles north of San Diego: "A very picturesque and attractive valley," he wrote. "In parts. . . more than two thousand yards wide; it is entirely covered with pasture, with some groves of trees, and has much water collected in pools. . . . All the country through which we passed was rich in pasture and not at all rough." A few days later Portolá wrote that the expedition ". . . halted in a most inviting valley where there was very much pasture and water." On September 8, Costansó wrote: "The land was pleasant, of good quality, with abundant pasture and quite a number of trees."

During late fall and early winter, before the rains began, the saddle and pack stock became quite thin, for the forage had dried and bleached, and they had been traveling steadily. But on January 4, 1770, Father Crespi wrote that the country was again covered with beautiful green grass, affording excellent pasture for their animals.

Many other travelers and residents in California from 1769 into the early 1850's commented about the excellent range and the suitability of the land for ranching and agriculture. In many cases they spoke in the most glowing terms. Information from these sources, from people who saw the country at the time, is valuable for gaining a general impression of the nature and extent of its rangelands in their pristine condition. These records are supplemented to some extent by reports

of early botanical collections and explorations during this period. But mostly they are relatively brief statements, with but little quantitative information, and are widely scattered in the literature. The precise nature of the plant cover—its botanical composition, floristic characteristics, grazing capacity, and other features that would be of supreme interest to the range scientist—must remain a matter for conjecture and speculation.

Since it is not possible to reconstruct an exact description of the range vegetation as those first settlers saw it, we must be content with a very generalized picture pieced together from bits of information left by those who did see it, supplemented with inferences from recent ecological studies of plant distribution and succession.

Two plant communities, or vegetation types, constituted the major forage resource of California. They were the grassland, or California prairie, and the oak woodland (also called "woodland-grass"). They occupied more than 30 million acres when settlement began. Today what remains of these two plant communities usually is referred to as the "annual grassland ecosystem." With a total area of some 15 to 16 million acres at this time and producing from 3 to 3½ million animal months of forage annually, these lands still constitute the major area of range forage production in the state.

When settlement began, the plant cover of these two communities was predominantly herbaceous, producing a high volume of palatable, nutritious feed. Most of these lands were, as Costansó wrote, ". . . not at all rough . . ." so that grazing animals could range over them with ready access to the forage. The mild climate made it possible for livestock to graze on open ranges throughout the year.

The prairie and oak woodlands were contiguous or intermingled throughout most of their extent, closely related floristically, and by some scientists have been considered to constitute a single plant community (Clements and Shelford 1939; Jepson 1925). Botanical composition was infinitely



Woodland-grass (savannah) plant community. The California prairie and the oak woodlands were contiguous or intermingled throughout most of their extent, and closely related floristically. Foothill woodland, often called "woodland-grass," Madera County. Blue oak (*Quercus douglasii*) is the characteristic tree here, imparting the woodland aspect. Photo May 1949. (Central California.)



California prairie (perennial grassland). Associated with the grasses are seasonal societies of forbs having very colorful flowers. When in full bloom these forbs may appear to be the dominant vegetation. A seasonal society of California poppy (*Eschscholzia californica*) in mixed annual-perennial grassland, Bear Valley, Colusa County. Photo May 1960. (Northern Calif.)

varied, but the essential character of the plant cover was indicated by a few distinctive components. Perennial bunchgrasses, chiefly needlegrass (*Stipa* spp.), originally dominated both the grasslands themselves and the herbaceous cover of the woodlands (Beetle 1947; Clements 1934; Weaver and Clements 1938). Purple needlegrass (*Stipa pulchra*) and nodding needlegrass (*S. cernua*) far overshadowed all the others in abundance. Foothill and large needlegrass (*S. lepida* and *coronata*) were important dominants in woodlands surrounding the valleys, especially in coastal regions south of San Francisco (Clements 1920). Wild-ryes (*Elymus* spp.), Junegrass (*Koeleria cristata*), melic grasses (*Melica* spp.), and other perennials were associated with the needlegrasses. These perennials were liberally interspersed with annual grasses, illustrated by foxtail and six-weeks fescues (*Festuca megalura* and *F. octoflora*), prairie three-awn (*Aristida oligantha*), and lovegrass (*Eragrostis orcuttiana*).

In the cooler, moister climate of the Northern Coast Ranges, oatgrasses (*Danthonia* spp.), perennial fescues (*Festuca* spp.), hairgrasses (*Deschampsia* spp.), and bentgrasses (*Agrostis* spp.) largely replaced the needlegrasses and their associates as dominants of the coastal prairies. The major species here were supplemented by erect perennials and a few sod-forming grasses as well as by a liberal sprinkling of native annuals.

Associated with the grasses throughout these plant communities were seasonal societies of broad-leaved herbs, or forbs, having very colorful flowers. When in full bloom these forb societies were a most conspicuous element of the floral cover, giving the landscape a characteristic aspect, especially in spring and certain periods of summer, when they appear to be the dominant vegetation.

An early Californian described such a scene as he saw it more than a hundred years ago:

The open spaces among the foot-hills, and more especially the prairies that skirt them, bloom in spring time with fields of wild flowers of every hue—all exceedingly brilliant and graceful. . . Sometimes a single variety will occupy several acres, to be followed by another patch equally extensive, covered by a different kind (Cronise 1868).

Many of the forbs were perennials; but great masses of

annuals—several hundred species embracing more than 50 genera—were even more typical. Less conspicuous, perhaps, but more important to the stockman, were the many forbs that added variety to the forage and increased its nutritional value. Outstanding in this respect were native legumes—a great number of clovers (*Trifolium* spp.), lupines (*Lupinus* spp.), and other genera.

Herbaceous vegetation of the other plant communities reflected the principal characteristics of the prairies and oak woodlands. In most cases dominants were different species of the same genera, or of closely related genera. In the forest, coniferous woodland, and shrub communities, significant amounts of forage were provided by browse from a great variety of shrubby plants, in addition to feed available from herbaceous species.

Estimates and Early Grazing Capacities

Because of the abundance of species, seasonal distribution and growth habits, and the nutritive value of many of these plants when cured on the stem, the forage was admirably adapted to production of range livestock. There is no available information to make a dependable estimate of the grazing capacity of California's pristine ranges. Any estimate made must be based upon a number of assumptions, some of them quite tenuous. The result can be considered only an indication of the order of magnitude of the grazing capacity for any given plant community, and of the relative grazing capacities between communities (Table 1).

Estimates which have been made indicate that modern cattle would require from 2 acres per animal unit month on California prairie to about 18 acres on the coniferous forest. Spanish cattle were considerably smaller than modern-day animals, averaging only about 650 pounds live weight when mature requiring about 20% less feed than the average steer of today (Burcham 1957). Therefore, on the pristine ranges these cattle probably required only about 1.6 acres of California prairie per animal unit month. This requirement would vary on the different plant communities, increasing to a maximum of about 14.5 acres per animal unit month for the coniferous forest.

Table 1. An estimate of grazing capacity of California rangelands in pristine condition.

Range plant community	Grazeable area (millions of acres)	Grazing capacity (acres per animal unit month)	
		Modern livestock	Spanish livestock
California prairie	22.3	2.0	1.6
Oak woodland	8.0	2.2	1.8
Marsh grass	0.2	2.1	1.7
Coniferous woodland	3.0	3.2	2.6
Sagebrush	5.5	3.8	3.1
Coniferous forest	11.0	18.0	14.5
Chaparral	2.7	15.0	12.0
Total grazeable area	52.7	—	—

The two most important plant communities, the California prairie and the oak woodland, together occupied more than 30 million acres when settlement began, or nearly 82% of the total grazing capacity of the rangelands. Total production of the California ranges probably was some 15 to 18 million animal unit months of forage per year. Grazed under management practices adjusted to growth characteristics and productive capacity, that plant cover could sustain a livestock industry of impressive magnitude even under yearlong grazing.

Distinctive Features of California Rangelands

The splendid forage resource of California found by the early settlers was different from that of any other range region in North America in at least three respects.

First, climatic conditions under which California rangelands evolved are distinctive. Essentially all precipitation occurs in winter, as rain. In contrast, grasslands east of the Rocky Mountains receive some winter snow, providing a definite dormant season for plant growth, but most of their precipitation occurs in summer, during the growing season.

Second, California grasslands—and grassland elements of the oak woodlands as well—were distinguished from related floral units in the Pacific Northwest, and from grasslands of the Great Plains, by the number and importance of annual plants—especially of forbs—in the plant cover. In fact, in many situations annual plants must have been dominant locally. Also, while many genera and a few species characteristic of other North American grasslands do occur in California, most of its dominant species are found only sparingly in other rangelands. Sod-forming grasses, very important in eastern grasslands, are virtually absent from California.

Third, ecological characteristics and physiological responses of the California flora to climate, to grazing, and other disturbances differ from those of other grasslands. Plants growing in regions of Mediterranean climate, where there is a long summer drought and comparatively high winter precipitation with low temperatures, must be ecologically adapted to tolerate an extremely great range of habitat conditions during every growth cycle. More particularly, they must be adapted to great variations in heat and moisture. They must be able to make good growth during winter when temperatures are low and soil moisture is high. Often the soil will be at or near the saturation level, with consequent poor soil aeration. In summer, these same plants must survive or evade low soil moisture and high temperatures comparable with those of the desert (Burcham 1961, 1975).

An especially important adaptation to Mediterranean climates is the time of year at which growth begins. On California rangelands growth begins in fall, when days are shorter and temperatures lower. Perennial grasses begin growth in late August or in September before fall rains occur (Burcham 1970). This early growth depends on food stored in the root during the previous growing season. Annual plants do not germinate until after the first effective rains. An effective rain is one that amounts to one-half inch or more in a single storm (Bently and Talbot 1951). Annuals evade summer drought by maturing seed at the beginning of the dry season; perennials, by a period of dormancy.

These characteristics are major elements in explaining changes that have occurred in California rangelands since grazing by domestic livestock was begun.

The Early Years: A Precarious Infancy

The first settlement at San Diego, in 1769, and the mission established by the padres a few days later did not insure permanent occupation. During the next seven years the province of California passed through a very precarious infancy. On several occasions the entire undertaking was almost abandoned.

In 1770 another mission and presidio were established at Monterey, some 300 miles to the north. More livestock, including the first sheep, and a few more settlers also arrived that same year. By 1772, three more missions had been added, bringing the total to five. But the fate of California continued to hang in the balance because of the small number of settlers and the lack of livestock and other supplies to support them.

It is difficult to imagine that there ever was a shortage of food in California, but that was the case for several years after that first settlement was begun. Livestock brought by colonists were not adequate for both food and breeding stock, and even the most bountiful land cannot be developed without man, domestic animals, and tools with which to work. At that time the province lacked everything from a plow to a blacksmith's forge; every nail or piece of cloth had to be brought from New Spain (Mexico). Most important of all was the need for permanent settlers with families. The Spanish population was unbelievably small, consisting of soldiers and the missionaries—there were no Spanish women in the province at all.

Bringing settlers, supplies, or domestic animals from New Spain required a long hazardous voyage by sea, or an equally difficult journey through Lower California. Either route involved long periods of time, frequent delays, and much expense. California's greatest need, if Spanish control was to be maintained or the full potential of the province developed, was a good land route from the thriving settlement in northern Sonora to San Gabriel Mission, thence northwest to Monterey, and on to San Francisco Bay.

In late 1773 a third-generation frontier soldier, a seasoned desert traveler "... tough as oak, and silent as the desert from which he sprang," was authorized to find such a route from Sonora to California (Bolton 1930; Chapman 1916). He was Captain Juan Bautista de Anza, commanding officer of the Presidio of Tubac in Sonora (north of the present-day Arizona border). Anza started from Tubac on January 8, 1774. When he reached San Gabriel on March 22, he had marked a trail through the deserts and mountains of Arizona and California, and found watering places for travelers. Anza went on to Monterey then retraced his route to Sonora, arriving again

at Tubac on May 26, 1774. After an absence of four and half months he had traveled nearly 2,200 miles on horseback!

Anza was now authorized to lead a party of settlers to California as soon as it could be organized. This expedition would include families and the livestock and equipment needed to put the province of California on a permanent basis.

The settlers started out on September 29, 1775. There were 30 families—240 people, of whom 115 were children (Newton 1975). They had 695 horses and mules, and 350 head of cattle—an impressive total of 1,045 domestic animals (Font, 1930).

Like Moses of Biblical times, Anza led his colonists across the desert wilderness toward the Promised Land of California. The settlers, from cities and villages, were mostly the lower classes. But once on the trail these same humble, unpretentious recruits showed extraordinary fortitude, patience, kindness, and good humor. Fatigue, thirst, an occasional threat of Indian attack, cold, rain, and sickness marked their slow progress.

On January 4, 1776, they reached the friendly shelter of Mission San Gabriel where they received a jubilant welcome. One person had died, and three babies had been born during the journey—a net gain of two. About one hundred head of livestock had been lost along the way, most of them when the thirsty cattle had stampeded from a dry camp the travelers were forced to make at San Gregorio, west of Borrego. From San Gabriel the settlers and livestock went on to begin a new settlement at San Francisco.

These families, livestock, and equipment brought by the Anza expedition were largely responsible for placing the settlements in California on a permanent basis.

The story of the livestock industry now resumes, with cattle ranching as the example. Sheep raising also has been an important range industry in California, but it followed much of the same pattern as cattle ranching, and has been described in detail elsewhere (Wentworth 1948).

From more than 50 years after the first settlement was established at San Diego, the province of Upper California was the northern outpost of Spain in the New World. With the coming of statehood and the discovery of gold—both in 1848—nearly every phase of economic and social life underwent very rapid changes. As California progressed from a frontier settlement of New Spain to the full role of statehood that we know today, ranching passed through a number of stages of development. We can identify some of the principal features of these, and date them approximately, but the time periods overlapped to a great extent.

Ranches of the Missions: 1769-1833

Spanish missions dominated ranching in California until the middle 1830's. By 1823, a chain of 21 missions had been located in the coastal region between San Diego and Sonoma. They were colonizing agents of the Spanish government, not intended to be permanent, nor was there any conveyance of land from the crown to the mission. Under both Spanish and Mexican governments, missions were permitted to occupy and use certain lands for the benefit of the Indians, but they could not own them. Once the Indians had been Christianized and civilized, mission settlements were to become towns, and lands occupied by the missions were to be divided among the Indians (Engelhardt 1920; W.W. Robinson 1948).



Spanish missions dominated the range livestock industry of California from the beginning of settlement until the mid-1830's. Mission Santa Barbara, often called "Queen of the Missions," Santa Barbara, Calif., was founded December 4, 1786.

Most of the missions had several ranches, each usually devoted to a single class of stock—cattle, horses, or sheep. At one time Mission San Luis Rey had 20 different ranches scattered over more than 100 square leagues of land. That's more than 440,000 acres! Mission San Gabriel had a total of 17 ranches for raising cattle and horses, and 15 more for sheep, goats and pigs. Ultimately, the missions claimed most of the land in the coastal areas occupied by the Spaniards, about one-sixth of the total area of California, some 17 million acres. At its height probably more than 400,000 head of cattle and 300,000 sheep grazed this mission-dominated pastoral empire.

Some of the settlers owned livestock, too; and soldiers attached to presidios also acquired cattle, horses, and sheep. As their herds became too large for the presidio lands or other pastures held in common, the governors were petitioned for lands on which to graze privately owned stock. The Viceroy in Mexico City authorized Californian governors



Cattle typical of the mission stock were a mixed breed with long, thin bodies; rather large bones that made them appear heavier than they actually were; and long, slender, widely-spreading horns. The above photo is one of the mission cattle of the small herd being maintained at Mission La Purisima, near Lompoc and also near Santa Barbara. Photo taken August 15, 1979.

to make crown lands available to citizens for grazing. These concessions were in effect long-term "grazing permits" for use of public lands, for they did not convey title to the settlers. About thirty of these concessions were made during the Spanish period, ending in 1822. Nearly all went to veterans of the army.

The Mexican Period: 1833-1850

When Mexico became independent of Spain, in 1822, a change began in California ranching. The mission ranches gave way to ranches in private ownership. The Mexican government began to make grants of land for ranching and other purposes, which conveyed full title to the individual. Only a few such grants were made before 1833, however, because the missions occupied most of the really good land in settled portions of the province. Between 1833 and 1836 the Mexican government secularized the missions, transferring control of most of the mission lands from church authorities to the civil government. These lands then became available for grants to individual Mexican citizens. The result was a great expansion of ranching on privately owned land, and a shift in population from the larger settlements to rural areas. By 1846, there were more than 500 operating ranches; all but about 30 were from former mission lands.

Fostered at first by the missions, encouraged later by governmental inducements, and favored at all times by the natural environment, ranching prospered immensely. The livestock industry constituted not only the basis of economic activity—it penetrated deeply into social life of the province as well. Life throughout California was marked by the dominance of pastoral pursuits, limited contact with the outside world, and the leisurely manner of living.

Ranching in Spanish California was not materially different from the pattern developed in Mexico during the preceding three centuries. This is in contrast to the situation in Texas and the Great Plains, where influence of Anglo-Americans resulted in modifications of practices that permeated the cattle industry of those areas to a great extent. Typically, California ranches covered large tracts of land, were devoted primarily to cattle production, and utilized principally the cheap, abundant local labor of missionized Indians. Usually, owners could live in town, leaving details of operation to an overseer, who was in effect the resident manager.

Animal husbandry practices were very rudimentary, consisting mainly of branding and marking stock, or cutting them out for slaughter. The main concern of the rancher was numbers of cattle, not size or rate of gain. In some cases herds were moved from one range unit to another as forage conditions demanded. Every owner of livestock was required to hold one general rodeo (roundup) every year for counting and marking his animals, but as a matter of convenience two usually were held. Many of the social gatherings were a direct outgrowth of these rodeos. Horses were used so much for working cattle and general transportation that the reluctance of the vaquero to dismount became legendary—in California as elsewhere in the West.

Cattle were valued chiefly for their hides and tallow. Especially after about 1825 these commodities were purchased in great quantity by American sailing vessels from Atlantic seaports (Dobie, 1939). One estimate is that five million hides were exported from California between 1800 and 1848. A merchant at Monterey paid \$36,000 to one mission in one year for its hides, tallow and Indian labor (Beechey 1831).

Most ranchers were Spanish Californians, but after 1820 a few Americans and Europeans began taking up residence in California. Many of them became naturalized citizens of Mexico to qualify for grants of land and engage in ranching.* They were prominent in both economic affairs and political events of California in later years.

Early American Ranches: 1850-1865

Discovery of gold brought rapid changes to California's cattle industry. The next 15 years were marked by three features: by an unprecedented demand for meat, by upgrading native cattle with improved breeds, and by intense speculation in the ranching industry.

The Gold Seekers who rushed to California created a prodigious market for meat almost overnight, and right on the doorstep of the California rancher. Attention was turned from production of hides and tallow to supplying meat for miners. Local production alone could not satisfy the demand. Cattle from the southern part of the state were sent to markets in northern mining districts in drives comparable in economic significance and picturesque detail to those that moved northward from Texas over the Abilene Trail some 15 years later. Large herds were driven to California from Mexico, Texas, and the Middle West. More than 150,000 head of cattle were brought to California from the Midwest alone in the two years 1852 and 1853 (Cleland 1941).

Introduction of livestock of improved breeds and upgrading the native cattle were among the first enterprises of American settlers. Many Gold Rush pioneers brought animals of better breeds with them; others were brought overland during the next few years; some were shipped from eastern ports and from Europe. Crossing these animals with California cattle was so successful that within ten years the native Spanish cattle were largely replaced by crossbred stock.

The demand for meat plus the limited local supply of cattle promoted intensive speculation in both land and livestock. However, the early 1860's brought a sharp decline in demand for beef. Cattle were held on the ranges, awaiting an improved market, and their numbers reached a record three million head in 1862 (Gordon 1883). Floods in the winter of 1862 caused major losses of livestock and were followed by two years of widespread, intense drought. Between 200,000 and one million cattle were lost from starvation (J.S. Hittell 1874; Wickson 1923), and great numbers were slaughtered for their hides because there was no feed for them. These events permanently curbed cattle production in California on a speculative basis, but the bitter lessons of this period resulted in the first positive steps being taken toward range management and improved animal husbandry.

Agriculture and Adjustment: 1865-1880

Crop agriculture made major inroads upon the open range between 1865 and 1880. This was a period of adjustment between ranching and agriculture. The years from 1860 to 1870 have been labeled as the "Decade of Wheat" in California. Great tracts of fertile valley land were diverted from grazing to production of crops, especially to growing grain. Most of the grain was shipped to Europe in clipper ships which sailed from San Francisco to Liverpool by way of the Cape of Good Hope. As settlement progressed and empha-

*Mexican citizenship was required only to receive a grant of land; it was not a requirement for engaging in any kind of occupation. Many Americans of that period engaged in a variety of occupations rather than ranching in California without becoming Mexican citizens.

sis on farming increased, laws were passed requiring livestock owners to fence their lands to restrain their stock from the property of others. This combination of farming and ranching virtually ended cheap, free range in the valleys and much foothill country. Consequently, ranchers began to shift to the higher foothills, and to the plateau and mountain regions of the state, ending the era of the pioneer cattlemen in California. By 1880, permanent settlement and changes within the industry itself had achieved distribution of livestock over essentially all the available rangelands in the state.

Modernization: 1880-1950

For about 70 years—from 1880 to 1950—the cattle industry was characterized by gradual development and change. Basically, this was a period of modernization. Ranching operations still were conducted principally on open range, but there were changes in methods and the introduction of newly developed ideas. The work of land-grant colleges in range management and animal husbandry played a significant part in these events, especially after World War I.

In the early part of this period, before 1900, livestock numbers fluctuated widely, largely in response to rainfall and its consequent effect on forage production, and on markets. Cattle numbers varied up and down from about 650,000 to more than a million a head. The turn of the century was accompanied by several years of favorable rainfall and generally good economic conditions. Cattle numbers increased to more than 1.6 million by 1910. The period from 1900 to 1910 was called the "Decade of Advancement of Livestock Industries." It was a time of large investments in meat-packing industries, and transition from pioneer methods and policies to more modern, systematic operations in meat processing and related activities. There was, also, an increase in the general appreciation of the values of well-bred livestock among ranchers.

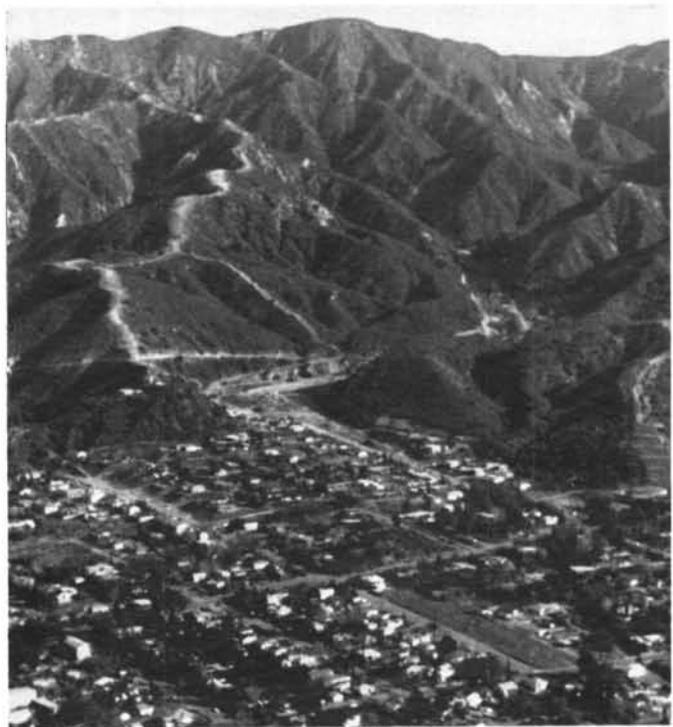
By 1930, however, cattle numbers had again declined to about one-half of the peak figure due to encroachment of crop agriculture and the generally poor economic situation following World War I. In the early 1930's a very gradual increase in the cattle population began, continuing through World War II.

An increase in beef cattle production in agricultural areas of the San Joaquin Valley, the South Coastal Region, and Imperial Valley, which began in the late 1920's, became stronger toward the end of the 1940's. Many farmers found they could profitably combine a beef cattle enterprise with their farm operations to utilize crop residues and grain stubble that otherwise would be wasted. This was one factor in subsequent development of feedlots in some of these areas.

Keeping Up with the Times: 1950-1980

Following World War II some very dramatic changes began to occur in the livestock industry in California. Between 1950 and 1975, cattle numbers shot upward by some 280 percent—to nearly 3.2 million head (U.S. Bureau of the Census 1952; California Crop and Livestock Reporting Service 1978), but the widespread drought of 1976-77 forced ranchers to reduce their herds, bringing a decline to about 2.6 million by January, 1978.

During the last century there has been no pronounced change in major areas where *range cattle* are produced in California; but there has been a significant shift in the area where *beef cattle* are produced. The most important areas of beef cattle production are now in the San Joaquin Valley and



After World War II millions of people moved to California—a surging wave of humanity reminiscent of the Gold Rush of a century before. The greater part of the area now in urban areas, cultivation, and other uses originally was prime rangeland. This photo shows urban development at the mouth of Big Tujunga Canyon, Los Angeles County. Photo taken January 24, 1973.

in Sacramento and Contra Costa counties. Greater use of irrigated pastures and crop residues for beef production has led to this concentration in the Central Valley.

Before World War II, beef production was a rather leisurely process: two- and three-year-old animals were grown out on a foothill ranges or mountain pastures. They went to market "grass fat" from the range, or were "topped off" for a few weeks on barley and hay; sometimes they went to the Midwest to be finished on corn.

A change in the production process which began in the 1930's was accelerated into high gear after World War II. Millions of people moved to California—a surging, hungry wave of humanity reminiscent of the Gold Rush migration of a century before. For the second time in history a huge market for beef was created on the very doorstep of the



*The California prairie (perennial grassland) was the most extensive and most productive range plant community when settlement began. Purple needlegrass (*Stipa pulchra*) on a prairie remnant on the former Rancho Santa Margarita y Flores (now Camp Pendleton Marine Corps Base), winter aspect. San Diego County. Photo March 25, 1955.*

California rancher. Again it was impossible to supply the demand from local production; again beef had to be brought in from outside the state—from as far east as central Montana, Colorado, and eastern New Mexico.

"Baby beef"—from animals 12 to 18 months of age—gained acceptance, thereby effectively cutting production time in half. Large commercial feed lots were developed, making it possible to produce beef of high quality and uniform grade. Feeding operations could be programmed to produce marketable animals at any time of year, eliminating reliance upon seasonal growth of forage.

Another development of equal importance was the advent of supermarkets on the west coast, providing an outlet for this beef during the entire year (Pope 1972). The combination of feedlot and supermarket had a tremendous effect on beef production, all the way from cow to consumer, from the range to the dinner table.

Finally, a vast system of highways was developed, making it possible to move live cattle and processed beef by truck to any place in California—or in the entire United States, for that matter—within a few hours or days. Calves born in California in fall may now spend the winter on our annual grass ranges, then go to Oregon, Montana, or even Canada for summer range. They then return to California for four or five months in the feedlot before being trucked to market in San Francisco or Los Angeles—to be served at lunch or dinner in Chicago, New York, or even Washington, D.C., a few days later!

All these events—many of which have happened off the ranch—have had a tremendous impact on livestock ranching and on utilization of our rangelands. One measure of their effect is that beef consumption has nearly doubled since the early 1950's and now amounts to about 115 pounds per person per year.

Change on the Range: Some Effects of Two Centuries of Use

Changes of many kinds have occurred during the last two centuries, greatly altering both the extent and character of the rangelands. Approximately 14 million acres of California now are in cultivation, or occupied by urban and industrial uses. The greater part of this land—probably as much as 12 million acres—originally was in the prairie and woodland plant communities, hence it has been removed from the total range area. The lands which today are most highly prized for agriculture were to a great extent the prime rangelands under pristine conditions.

Within the rangelands that do remain, the most striking change has been replacement of native perennial grasses by annual plants, a large proportion of them introduced from the Mediterranean region of the Old World. Grazing by domestic animals was itself a major factor in bringing about this replacement, but it was by no means the only cause. Deficiencies in rainfall and variations in other climatic factors contributed to it, too, as did nutritional deficiencies in the forage, and patterns of ownership and land use practices.

Few places on earth, if any, have had such rapid, large scale replacement of native herbaceous vegetation by alien plants within so short a time. To a large degree it was accomplished within the 20 years between 1845 and 1865. But the process began almost as soon as the first settlement was founded, and continues today. Adobe bricks from the oldest portions of the earliest mission buildings contain remains of introduced annual plants, showing that they were abundant around the mission sites when the buildings were

being constructed (Hendry 1931).

Although early settlers brought many crop and garden plants, they were not of consequence in replacing the native vegetation. Plants important in this respect were introduced unintentionally, almost without exception. They came mainly as "hitch hikers": in packing materials; as impurities in cultivated crops; in ballast of ships; even in the coats of domestic animals. Early accounts confirm widespread distribution of introduced plants at an early date. At least 95 of these plants which are important today were fairly well established by 1860, with grasses and composites being most numerous (Robbins 1940).

Annual Plant Succession on California Rangelands

Four stages of plant succession, in chronological sequence, were of major importance in the replacing of native perennials by annual plants. It is highly significant that this chronological sequence in dominance corresponds directly to the descending scale of annual plant succession. Also, it is directly related to different intensities of grazing use and can be reversed by changes in grazing practices.

Superficially, California rangelands did not differ much in appearance from many eastern grazing lands. Early ranchers stocked and managed them according to practices with which they were familiar. But forage cover was deceptively lighter than on grasslands having summer rainfall; production was not renewed during the grazing season by summer rains; and ecological responses of plants of this and other Mediterranean regions to grazing were distinctly different in ways that ranchers of European origin did not realize. Disturbances of the plant cover of the rangelands, by grazing or other activities, favored vigorous responses by native annual plants, some of inferior quality, and by introduced annual grasses and forbs. Rangelands with these characteristics can change strikingly under impacts of domestic grazing animals.

Ecological Adaptations of Annual Plants

A major part of the explanation for the "change on the range" lies in adaptations of annual plants to the distinctive environmental conditions of Mediterranean lands—in regions such as California. The introduced annual plants evolved in regions having climates similar to California, surviving for centuries under heavy grazing by domestic livestock, where all but the most aggressive, adaptable genetic strains were eliminated. They are particularly adapted for distribution by seed, have a wide range of tolerance to soils and other site factors, germinate quickly under favorable conditions, grow rapidly, and mature and set seed quickly. Great quantities of highly viable seed are produced; a high germinative capacity is retained by seed sowed naturally in litter and duff, as well as by seed stored under only marginally favorable conditions for a period of years. Finally, these plants compete effectively with other species and are able to maintain themselves in unfavorable situations for many years. These characteristics are held in common by most of our native annuals, as well as by the introduced species.

Because of their specialized adaptations, their aggressive growth habits, and their tolerance for a wide range of habitat conditions, these alien plants and our native annuals have been enabled to transform the essential character of California's rangelands. Changes in plant composition and vegetation structure have been accompanied by lowered productivity and reduced nutritional efficiency for livestock,

resulting in ecologically significant shifts in biotic relationships of the plant-soil-animal complex of the range ecosystem.

However, there are many bright spots in this picture. Some of the alien plants are excellent forage. More importantly, even at first, changes in grazing lands were so obvious that they could not escape notice of those early day ranchers, who were thereby stimulated to take steps to restore them. Unfortunately, knowledge of the growth habits of these plants and of grazing practices needed for management of the ranges has not been available until recently. As of now, many effective measures have been developed, and information is accumulating to make it possible to maintain an upward trend in range forage production and range condition.

Current Status of the Cattle Industry

Today in California, the most populous state in the Union, livestock ranching still is a major industry. Grazing beef cattle on ranches and farms is the most widespread agricultural activity in the state. Some 36 million acres are natural

grazing lands (Reed 1974). In addition, agricultural wastes and by-products from several million acres of cropland are used by range livestock each year. Only one county, San Francisco, does not have a significant range livestock industry. Forage from our rangeland produces about 410 million pounds of beef and lamb every year. At 1977 prices, its value was nearly 149 million dollars. In terms of income produced, livestock has for years been the foremost agricultural commodity in our state. In 1977, due to the drought, it dropped to second rank for the first time.

The facts discussed in this article constitute an important basis for understanding the effects of settlement and use of California's rangelands for more than two centuries. They go a long way toward explaining the "change on the range." An historical perspective, a knowledge of past events and how they apply to what we now see before us, is fundamental to understanding our range resource and what can be done to restore and manage it.

Those early Spanish pioneers who thought California was excellent ranching country certainly knew a good thing when they saw it.



Hereford cattle on spring range dominated by annual grasses, Tuolumne County, north central California. Photo taken April 20, 1972.

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