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THE SAGE PLAINS OF OREGON

BY FREDERICK V. COVILLE,
Botanist of the U. S. Department of Agriculture

The states of Washington and Oregon are cut in half from north to south by a great mountain range known as the Cascades. By this climatic barrier the eastern portions of these two states are transformed into a great arid plain centering about the valley of the Columbia river. The eastern limit of the plain is the western base of the Bitterroot mountains toward the north and of other ranges belonging to the Rocky mountain system further south. Thus is formed a great wedge-shaped area, its base toward the south, where the plains are continuous with those of Nevada, and its apex toward the north, where the plain is finally shut in by the boreal forest-belt which connects the northern end of the Bitterroots with the northern end of the Cascades. Near the center of this triangle, in northeastern Oregon, rises a great, irregular mass of rock known as the Blue mountains, which projecting into the plain from the eastward almost divides it into two portions, the resultant plains area being roughly of the shape of a dumb-bell, the upper half lying in Washington, the lower half in Oregon, and the two connected by a narrow neck in the mid-northern portion of the latter state. The area is drained largely by the Columbia river, which has cut its way through the Cascades to the Pacific. In the southern portion of Oregon the streams in many places find no outlet to oceanic waters, but flow into alkaline lakes and marshy sinks, from which their water either percolates into the soil to find an outlet elsewhere or is evaporated into the dry atmosphere. In altitude the plains range from less than 500 feet along the Columbia river valley to 4,000 and even 5,000 feet in the more distant portions. From north to south in a direct line the extreme length of the plains is about 450 miles, from east to west in the northern portion about 150 and in the southern portion about 250 miles, the relatively narrow neck connecting the two being constricted in its narrowest part to not more than 15 miles.

The first white men to penetrate this region were those belonging to the expedition of Lewis and Clarke, who crossed the
Bitterroot mountains from the east in the summer of 1805 and traveled laboriously across the plains and then down the valley of the Columbia to the ocean. The subsequent history of eastern Oregon may be divided into the period of occupation by the Hudson’s Bay Company and other fur-dealing organizations, then the period of gold-mining excitement, and finally the period of agricultural settlement, beginning with the Grand Ronde and stretching out to other less attractive localities.

Two decades ago the plains of eastern Oregon, south of the Blue mountains, were practically an unsettled region. It was then generally recognized that the country was capable of producing a good quality of beef in enormous amounts, and the available land was rapidly taken up, chiefly under homestead entries, so that now there remains little land worth entering. The country, however, is still very sparsely settled. Perhaps the most suggestive fact about the whole region is that no point in the United States lies further from a railroad than the center of this plain. Even the great desert from Death valley eastward across southern Nevada and Utah is more deeply penetrated by railroad lines than is this great wilderness of eastern Oregon.

Traveling southward from the Dalles to the southern part of the state and then eastward into Idaho one can go more than a thousand miles without crossing a railroad track, although no point is more than about 160 miles in a direct line from some railroad connection.

In the year 1893 the Division of Botany in the Department of Agriculture began to make a comprehensive examination of the vegetation of these plains, beginning with the Columbia plains proper, in the state of Washington. In 1894 this work was continued southward across the Columbia through the neck of the dumb-bell and down nearly to the southern boundary of the state of Oregon. In 1895 the work was interrupted for more urgent explorations in the Cceur d’Alene mountains, but in 1896 it was again taken up and the remainder of the Oregon plains was covered. The collections made in these three years, though not confined entirely to the plains region, but including also some of the adjacent forested mountain country, contained not far from 1,800 species, and it is probable that the plains themselves, as distinguished from the forests upon the surrounding mountains, contain not less than 1,000.

This year the route followed was from the town of Ontario, on the Snake river, westward to Harney, from which place a side trip was made northward in the summer of 1805 and then traveled south from here westward across the plains, where north and south mountain ranges lie over the Cascades to the railroad.

The whole country appears to be very remote geological periods since being cracked, uplifted, and worn. Almost every plateau ends in canyons known throughout the region as the most characteristic surface. The shores of the lakes are of every valley is inclosed by such canyons.

The vegetation of the country is dominated by the well-known Artemisia tridentata, a six feet high, closely related to sagebrush, having in common with that plant a strongly aromatic odor. Away from the shores of lakes, sage brush forms a gray mantle and constitutes the vegetation. It is a plant the few animals and by those only grow with little moisture and temperature. Sage brush gives a level stretch is known as a sage brush; the odor upon the atmosphere.

After a season’s lack of rain the sage gray and everything has a dry brown appearance, of hot rocks, and parched earth. The spring rain the sage brush pales to a pale bluish green, soft and velvety in some far-off lava-covered hills, but where there has been no rain for months, a mountain brings to the thirsty vegetation. In a summer thunder-storm the sage brush pales to a soft peat green. If the rain continues to carry water, the sage brush returns to drink. Sometimes the tea of sage grows to a few feet high, the broods of young in the tall grass.
t in the summer of 1805 and 1806 and then down the valley of the Columbia plains. The expedition then traveled south from Harney to Steins mountain, then westward across the plains, winding back and forth between the north and south mountain ranges to Fort Klamath, and finally over the Cascades to the railroad.

The whole country appears to have been covered at some not very remote geological period by a great sheet of lava, which has since been cracked, uplifted, and depressed in various portions. Almost every plateau ends in an escarpment of naked basalt, known throughout the region as rim-rock, perhaps geologically the most characteristic surface feature of the country. Nearly every valley is inclosed by such a formation.

The vegetation of the country consists primarily of sage brush, the well-known *Artemisia tridentata* of botanists, a shrub three to six feet high, closely related to the wormwood of Europe, and having in common with that plant a light gray color and a strongly aromatic odor. Away from stream beds and sinks and the shores of lakes, sage brush covers the whole country like a gray mantle and constitutes probably nine-tenths of the total vegetation. It is a plant the herbage of which is eaten by few animals and by those only in starvation times, one that will grow with little moisture and will stand the widest range of temperature. Sage brush gives to the country its character. A level stretch is known as a sage plain; the grouse which live there are known as sage hens; the fuel of the region is sage brush; the odor upon the atmosphere is that of sage brush.

After a season's lack of rain the sage brush turns to a blackish gray and everything has a dead, burned-out look, suggestive of thirst, of hot rocks, and parching winds. But after a soaking spring rain the sage brush puts on a new coloration, a delicate pale bluish green, soft and very pleasing to the eye. Occasionally in some far-off lava-covered basin of the plains, where there has been no rain for months, a stream bed stretching down from a mountain brings to the thirsty plain the water that has fallen in a summer thunder-storm upon some high peak, and as a consequence the dark gray blanket of sage brush is lighted up by a line of soft pea green. If the stream bed is one that still continues to carry water, the sage hens gather along it from miles back in the plains, and every morning and evening come down to drink. Sometimes the teal and other ducks, if the mountain is high enough to produce a perennial stream, bring up their broods of young in the tall grass along its margin. In one day's
journey of about 20 miles along such a stream we passed, by actual count, 389 sage hens and brood after brood of ducks, while at one point we started up, at a distance of half a mile, a herd of 20 antelope, which lined-up like Indians and trotted away from their drinking place over the rim of the plateau. They were doubtless on their way back to their grazing grounds, where even at the present stage of civilization no hunter ever disturbs them.

Regret is sometimes expressed that sage brush, abundant as it is, does not furnish a succulent, palatable herbage suited to the appetites of cattle and horses. If it did, what an inexhaustible supply of forage these arid plains would support. But those who suggest such a resourceful condition of affairs have forgotten that the cause of its abundance and wide distribution is undoubtedly the protection against the ravages of grazing animals afforded by its disagreeable taste, so that it can grow, produce its seed, and spread almost unchecked. Had it been a grazing plant, suited to the appetite of antelope and deer, and later to that of sheep, horses, and cattle, it would long since have been exhausted and the Oregon plains have become as bare of sage brush as some of the Wyoming plains are bare of grass.

A few other shrubs form an inconsiderable part of the woody vegetation, but these and the sage brush make up by no means all the plant life of the country. As the snow melts away in the spring, the well moistened soil between the Artemisia bushes becomes covered with the seedlings of innumerable annuals. For a few weeks the ground is carpeted with these plants, which flower in the greatest profusion, but after about two months they ripen their seeds, dry up, die, and disappear. Growing with these annuals is another type of plants, tuberous-rooted perennials, which have stored up during the preceding year's growth a large amount of nourishment. They therefore bloom at the first break of spring, go through a brief period of rapid growth, lasting usually a little longer than that of the annuals, and then the newly formed bulbs, well protected by impervious coats against the desiccating influences of a long, dry summer, carry over a full supply of plant food for the next spring's blooming.

At some points in the higher altitudes of the sage plains, in level or slightly depressed areas which catch and retain for a time some of the water from the melting snows in spring, a dense meadow of fine grasses, interspersed with the greatest profusion of brilliantly colored flowers, is formed, and as one of the most abundant is the blue-flowered esculenta, these formations are cover from a few acres to many. In summer these meadows, dried out, the fine black soil, shining open in deep, ragged cracks, an ordinary spade makes scarcely of it broken off with a pick and the shining surface very similar to that of a camas meadow reaches to the flowers, the seeds and dormant bulbs, the plants over the remaining

As one descends from the higher and approaches a lake or the alkaline and the vegetation is followed by a somewhat similar greasewood, Sarcobatus vermiculatus, alkaline valley bottom is dry and absolutely devoid of vegetation, the greasewood may be succeeded and this in turn by an incrustation of briny water or oozy soil, as frequently happens, the water is nearly fresh, it supports a dense line of salt grass may be grasses, the area covering thousands of acres and furnishing forage. In still wetter soil, grows a line of tule, as it is known to botanists as Scirpus.

At the western base of Steens, formed on the east by the west by an abruptly ended succession of marshes or sloughs, a flowing stream and covering acres. This land constitutes a ranch, consisting of 180,000 part well watered. Indeed the supply of the region and control of the grazing land belonging to the cattle are driven out into these meadows for several weeks upon the same
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esculenta, these formations are known as camas meadows. They
cover from a few acres to many hundreds. By the middle of
summer these meadows, drained by some creek or rivulet, are
dried out, the fine black soil, extremely sticky when moist, gap-
ing open in deep, ragged cracks and becoming so hard that an
ordinary spade makes scarcely any impression upon it. A lump
of it broken off with a pick and cut with a knife shows a smooth,
shining surface very similar to that of pipe-clay. When the soil
of a camas meadow reaches this stage of dryness, the vegetation
ripen, the seeds and dormant bulbous underground parts carry-
ing the plants over the remaining period of drought.

As one descends from the open plains into the valley bottoms
and approaches a lake or the sink of a stream, the soil becomes
alkaline and the vegetation changes, the sage brush being fol-
lowed by a somewhat similar hard-wood spiny shrub known as
greasewood, *Sarcobatus vermiculatus*, and this, in turn, in case the
alkaline valley bottom is dry, is succeeded by a hard-baked soil,
absolutely devoid of vegetation. If the valley bottom is moist,
the greasewood may be succeeded by a green carpet of salt grass,
and this in turn by an incrustation of salt, often with a thin cov-
ering of briny water or oozy alkaline mud in the center of it. If,
as frequently happens, the water in one of these valley bottoms
is nearly fresh, it supports a more luxuriant vegetation, and the
dense line of salt grass may be followed by taller succulent marsh
grasses, the area covering hundreds and sometimes even thou-
sands of acres and furnishing an almost inexhaustible supply of
forage. In still wetter soil and surrounding the open water
grows a line of tule, as it is called, a species of tall bulrush,
known to botanists as *Scirpus lacustris occidentalis*.

At the western base of Steins mountain, in a great groove
formed on the east by the sloping mountain base and on the
west by an abruptly ended uplift of the lava crust, lie a long
succession of marshes or slews, as they are called, connected by
a flowing stream and covering probably a hundred thousand
acres. This land constitutes the principal part of an immense
ranch, consisting of 180,000 acres of fenced land, for the most
part well watered. Indeed it covers all the available water sup-
play of the region and controls a several times greater area of arid
grazing land belonging to the government. In the spring the
cattle are driven out into the open sage brush, where they graze
for several weeks upon the abundant spring vegetation. Later,
as the dry summer begins and this transient forage supply is exhausted, the stock is driven higher upon the plateaus or the mountain slopes, where they find an abundance of bunch grass. Then, as the cold weather of autumn sets in and the snows begin, the cattle are brought down again to the marsh lands, and when the swamps are frozen over and the ice is sufficiently thick they are driven out upon it and there eat the air-dried sugar grass and cane grass and tules. Finally, forewarned of the opening spring by a warm chinook from the southwest, the Mexican vaqueros, or buccaroos, as they are more commonly called in the language of the Oregonians, clear the cattle off the ice before it finally breaks up. Every summer an immense amount of hay is secured from these great meadows, about three thousand tons being annually cut and stacked for winter use on this particular ranch. During the storms of winter the cattle on the ranch are, as far as possible, fed and sheltered, but heavy losses from freezing and starvation frequently occur.

In 1889-'90 occurred one of those long, hard winters which are expected in eastern Oregon perhaps once in ten years. Snow began to fall earlier than usual and continued almost incessantly throughout the winter. The stock caught out upon the range were wholly inaccessible and could not be brought into the corrals. The cattle that were under shelter at the time the conditions became serious were fed as long as the supply of hay lasted, and then, the spring not breaking at its accustomed season, the animals slowly starved. The loss by starvation in the entire region varied from 30 to 70 and even 90 per cent. Those stockraisers who were well prepared for such an emergency escaped with a set-back of a year or two in profits, but those who were taken in the worst condition were in many cases ruined.

The Indians who once lived upon these plains found, through centuries of slowly-gathered experience, not only that they could exist, but that they could live in comfort, building themselves shelters of tules and of juniper brush, and easily obtaining an abundant supply of game and rich, nutritious food with all the articles necessary to the manufacture of their various implements, their clothing, their cooking utensils, and in fact all the other necessaries of an out-door existence and the luxuries of savage life.

Perhaps no Indians in the far northwest have been guided by better counsels from their chiefs, have shown a greater desire to assume the conditions of civilized life, or have proved themselves more capable of developing the Klamath Indians of Oregon together upon a reservation, about the southwestern part of the Oregon, ested and partly covered with a forest, is a part of that upon which they have been removed from the wild state; developed, they furnish an example of an intelligent Indian tribe, in living the best and most deeply habits and substituting for the tendencies of centuries. They cut hay for winter use, and raise occasionally a few vegetables in separate farms and are now learning their blacksmiths, carpenters, and being educated at the agency.

At least a hundred species are still used by the Klamath Indians as their staple farinaceous food, the water-lily of the northwest, Nymphaea odorata, being inexhaustible quantities in the bulbs of the camas plant, of which are cut hay for winter use, and occasionally a few vegetables.

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The transient forage supply is upon the plateaus or the abundance of bunch grass, when in and the snows begin, the marsh lands, and when is sufficiently thick they the air-dried sugar grass prewarned of the opening southwest, the Mexican more commonly called in the cattle off the ice before an immense amount of hay about three thousand tons. If used on this particular he cattle on the ranch are, heavy losses from freezing long, hard winters which once in ten years. Snow continued almost incessantly sought out upon the range be brought into the corn cut hay for winter use, and raise a small quantity of grain and occasionally a few vegetables. They build fences around their separate farms and are now building houses of sawed lumber, their blacksmiths, carpenters, shoemakers, and other artisans being educated at the agency schools.

At least a hundred species of the native plants of the region are still used by the Klamaths in one way or another. One of their staple farinaceous foods is the seed of the great yellow water-lily of the northwest, *Nymphaea polysepala*, which grows in inexhaustible quantities in the marshes of the reservation. The bulbs of the canias plant, of which enormous amounts are pried out of the ground in spring with a camas stick or digger, furnish another excellent and favorite food. The most important of their fleshy fruits is a huckleberry, *Vaccinium myritilloides*, which covers the mountain slopes in some parts of the neighboring Cascades. The best of their fibers is a perennial blue-flowered flax, *Linum lewisii*, which grows without irrigation in the open sage brush at higher altitudes. They get a beautiful lemon-yellow permanent dye from a yellow lichen, *Evernia vulpina*, which grows abundantly on the trunks of trees in the pine forests. Some of these plants and others equally useful may well attract the attention of agricultural experimenters.

In view of the present agricultural depression, which appears to be especially severe in the plains of eastern Oregon, the question naturally arises what the future promises in the way of relief; whether the agricultural capacities of the region are such as to offer a fair prospect of relief by some modification of the prevailing system or whether the result must be the gradual abandonment of present settlements. This is notably one of
those regions in which money is made out of only one product, in this case, forage. The forage crop is not immediately exchanged for money, but is used to fatten cattle for beef, to raise horses for farm and other purposes, and to grow sheep for wool. At present the low price of wool has practically put an end to sheep grazing. The low price of horses, as draft animals, has resulted in the inability of the ranchers to market their stock, horses fresh from the range being now worth in some parts of Oregon no more than five dollars per head. The actual products of the region, therefore, are essentially limited to one, namely, beef cattle, and the price of these is so low that the income is barely sufficient to pay the expenses of managing the ranch.

One practical modification of the present system is clearly apparent to the traveler. Ranchers have been accustomed under the high prices of former years to neglect the ordinary processes of farming and to purchase their entire food supply from the outside, paying not merely the first cost of the food in eastern markets, but the cost of railroad transportation and of a long wagon haul besides. The ranchers of the plains have assumed rather than proved by experience that the country is incapable of producing the ordinary farm crops, such as are necessary for family use. There is no question that a proper use for gardens and field crops of some of the water which now either goes to waste or is turned upon grazing lands would be a most important step toward bettering the present agricultural conditions. This lesson, indeed, is now being learned practically from force of necessity, and in many places where it has been assumed from the occasional early or late frosts that certain crops could not be grown it is now found that with proper foresight and care excellent crops are produced.

Another lesson to be drawn from the fact that the native races obtained an abundant subsistence from these same plains in which a civilized race now finds it hard to subsist is that it is impossible to carry on with success in an arid region an agriculture developed in a humid region, unless important modifications are introduced. This lesson has already been learned in some other parts of the country, as, for example, in western Kansas, in Indian territory, and in northern Texas, where after years of largely unsuccessful trials it was found impossible to depend upon the typical American stock feed, Indian corn, but it was found possible to grow a cereal of the old world, now commonly known as Kafir corn. This has conditions too arid for Indian feeding farm stock of all kinds, great subarid belt in that region become the staple crop, and with it in the markets of the world convertible into money, yet, with draft animals, it brings quite well.

Though this particular crop is of Oregon, it suggests strongly the plants well adapted to that region just made on the native plants are many food-producing species, and there is a reasonable probability that by careful cultivation and selection of agricultural products. The bringing, however, can be the outcome only of cultivation and it offers no immediate possibility to the United States which a trip particularly impresses upon the destrucion of our great natural to this that the local aggravation is in some parts of the national campaign of twenty years appointed a commission to report the forestry problem of the United States the study of our great grazing areas the time will come when a similar proposition to the government for some exhaustion of the forage supply over-grazing year after year, if ably kills out the native forage largely by introduced weeds. They never regain their former luxuriant life, under moderate yearly a good crop, or after a few years of rest regain.

Only a comparatively small lands of the west are under
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known as Kafir corn. This has been found to flourish under conditions too arid for Indian corn, to produce heavy crops, and to have about the same nutritive qualities as that product for feeding farm stock of all kinds or for human food. There is a great subarid belt in that region in which Kafir corn has now become the staple crop, and while there is no great demand for it in the markets of the world, and it is not, therefore, directly convertible into money, yet, when transformed into pork, beef, or draft animals, it brings quite as good a price as Indian corn. Though this particular crop is probably not suited to the plains of Oregon, it suggests strongly that there may be equally valuable plants well adapted to that region. The observations we have just made on the native plants demonstrate the fact that there are many food-producing species which stand the climate well, and there is a reasonable probability that some of them might by careful cultivation and selection be turned into useful agricultural products. The bringing about of such a result, however, can be the outcome only of long and laborious experimentation and it offers no immediate solution of the present problem.

There is one phase of wastefulness of the natural resources of the United States which a trip across the plains of Oregon particularly impresses upon the traveler, namely, the careless destruction of our great natural wealth of forage. It is doubtless to this that the local aggravation of the present agricultural depression is in some parts of the country due. After an educational campaign of twenty years the government has recently appointed a commission to report a practical plan of dealing with the forestry problem of the United States. From the condition of our great grazing areas in the west it seems probable that the time will come when a similar popular demand will be made upon the government for some means of preventing the exhaustion of the forage supply on the public lands. Continued over-grazing year after year, it sufficiently excessive, unquestionably kills out the native forage plants, which are then replaced largely by introduced weeds. The original nutritious grasses never regain their former luxuriance and sometimes are almost exterminated. Under moderate grazing the native species produce yearly a good crop, or if even slightly over-grazed will after a few years of rest regain their former abundance.

Only a comparatively small percentage of the arid grazing lands of the west are under private ownership. Most of the
grazing is done upon the public lands. When the price of beef or other product of grazing was high, as it was, for example, ten years ago, it was to the immediate interest of every cattle owner to fatten the largest number of stock in the briefest possible time, regardless of the effect of so doing upon the future productiveness of forage. Not only is the system a bad one theoretically, but its practical effects are manifest in the actual conditions of many portions of our grazing regions today, and if the prices of the products of grazing continue high enough to make grazing a profitable industry, the condition of affairs is bound to become gradually worse, and we shall ultimately, in section after section, ruin our grazing lands.

The correction of the evil may be brought about, it seems to me, by one of three methods. First, by a system of licenses which shall regulate the number of cattle to be grazed on a given area. A similar system has been proposed for our forest lands, and some plan of the kind seems likely to be adopted. The principal objection to licenses in the case of grazing lands is that the responsibility of the government would be great and the administration of such a law would add enormously to the machinery of the executive.

A second and perhaps preferable method is the private ownership of land. It is evident that it is to the advantage of an owner to maintain his land at its greatest continued productiveness, and he would not, therefore, seriously over-graze it. As a matter of fact, the great cattle ranges, which are either owned by individuals or corporations, or are essentially theirs through the control of the available water supply, are in far better condition today than the public lands, which are common grazing grounds, and many of the areas thus controlled are in just as good condition as they ever were.

A third method of securing responsible management of grazing lands is a long-term lease from the government. The principal objection of cattlemen to private ownership of land is the necessity of paying taxes. This difficulty would be obviated by a lease of the land from the government, and, even though the amount paid were small, the advantage of an interested management would prove of the highest benefit to the general public, while the government would still retain its title to the land and after the expiration of the lease could make new terms, based on longer experience and changed conditions.