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DECIDUOUS FOREST MAN AND THE GRASSLAND FAUNA[1]

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I. INTRODUCTION

THE droughts and dust storms of recent years have called attention to the grasslands of central United States and Canada. Much has been written regarding the Great Plains on the subjects of (a) too extensive use of the plow, (b) overgrazing, (c) erosion. Remedies have been suggested, such as seeding with foreign and domestic grasses, special agricultural methods and the planting of shelter belts. There remains one factor in the disasters of the great plains that has not been evaluated or even adequately brought to attention, that is the sum total of original native animals of the grassland biotic community.

The grassland originally presented a fine array of grasses tall and luxuriant at the eastern edge and relatively short and hardy at the western. It originally presented an excellent group of animals living in a state of dynamic balance. But to the new human arrivals, the immense herds of bison merely meant free meat and free hides. As to the use of grassland animals by fur and hide seekers, noteworthy records are in the journals of Lewis and Clark (1804–05, Thwaites)[2] and of John C. Luttig (1812–13).[3] Lewis and Clark crossed the entire grassland area. The first grassland animals, notably the bison, were seen in southeastern South Dakota. The bison fitted the climate and grassland so well that its population (total, 75,000,000; Great Plains, 50,000,000) exceeded the

[1] Invitation paper read by title before the eighth American Scientific Congress, Section of History and Geography.

[2] R. G. Thwaites, "The Original Journals of the Lewis and Clark Expedition, 1804–1806." Vols. 1–3. New York, 1905.

[3] J. C. Luttig, "Journal of a Fur-trading Expedition of the Upper Missouri, 1812–13." Edited by Stella M. Druman. Missouri Hist. Soc., St. Louis. 1920.

present human population on the same area. The antelope was also an important game animal with a total population estimated at 30,000,000, 8,000,000 of them on the Great Plains. Associated with the spectacular ungulates were the well-known wolf, coyote, kit fox, badger, numerous well-known rodents such as the prairie dog and thirteen lined ground squirrels and a full quota of smaller rodents and small predators.

During the early cattle days, trapping was an important vocation on the plains. Colonel Richard Irving Dodge[4] says:

When I first came to the "Far West," thirty-two years ago, trapping was still an institution (about 1850). Generally alone, sometimes in couples, rarely in more numerous companies, trappers ranged the whole country wherever peltries were to be had. . . . Each, making his way to the village of Indians most convenient to the territory in which he wished to trap, proceeded to interview the chief, whose friendship and protection were gained by generous presents. . . . Other presents purchased one or more squaws and a teepee. He thus became a member of the tribe.

The principal rough hides from the grassland were bison, antelope, wolf and coyote. Since the bison hides constituted a large part of those traded, there was a sharp decline in the fur business with the extirpation of this animal which came about in large areas soon after 1870. Most of the furs were from the water courses, and to what extent such species as the kit fox, spotted skunk and black-footed ferret were utilized is not clear, though Woodhouse[5] mentions foxes in connection with the southern plains. Lewis and Clark mention trade in kit fox skins in eastern Montana.

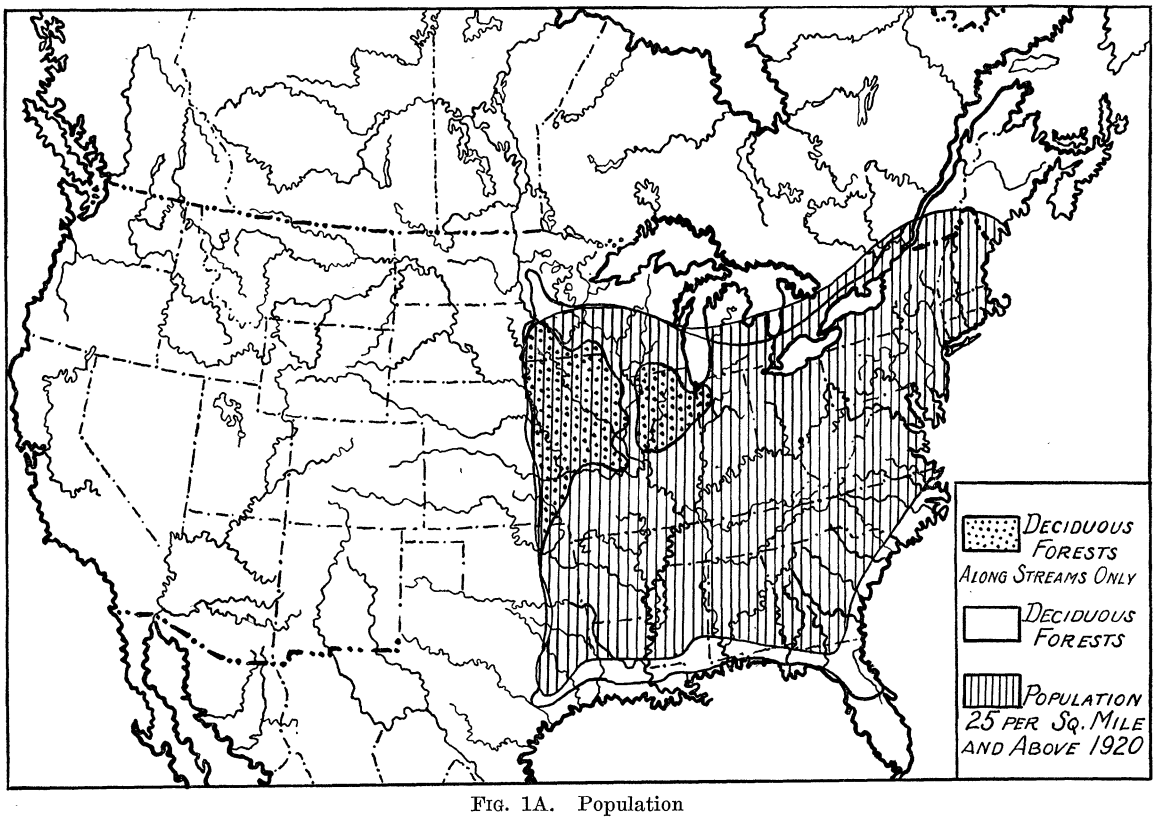

FIG. 1A. Population

Both maps show the concentration of the white man's activities in the deciduous forest areas. (See opposite page or B. Energy and health).

While the treatment of the grasses by the white man is notoriously bad, the consideration and management for the animals was in general far less intelligent than for the grass itself. The cow perhaps necessarily replaced the bison and antelope. No one could be expected to tolerate the wolf, but while these were being destroyed and after they were gone, an entirely unscientific attack on the remaining animals has continued unrelentingly.

The main objective of this discussion is to point out the interactions of the four elements involved in ex-

[4] Richard I. Dodge, "Our Wild Indians." Hartford. 1883.

[5] S. W. Woodhouse, Report on the natural history of the country passed over by the exploring expedition under the command of Brev. Capt. L. Sitgreaves. Mammals. In Sitgreaves' report of an expedition down the Zuni and Colorado Rivers. 198. Washington, D. C. (U. S. Cong. 33, First Session. Senate Ex. Doc.) 1854.

ploitation of the North American grasslands; the biotic community animals, the plants, the habitat and the settlers. This involves a discussion of each of the following:

(1) The original character of the native animals and their interactions or coactions with each other and with the plants.

(2) The general character of the plains habitat and its plant community.

(3) Certain physiological and psychological characteristics of the white settlers, together with their customs, cultural background and industrial prejudices.

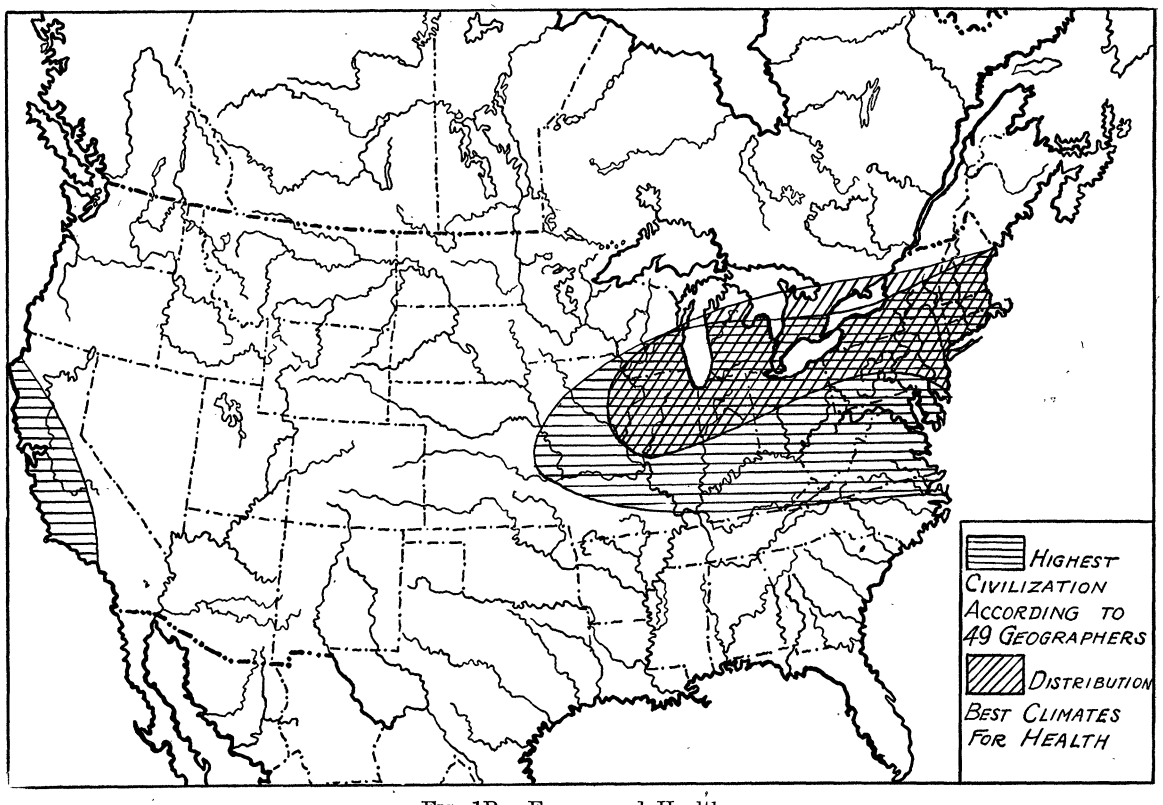

FIG. 1B. Energy and Health

It seems best in a review of the history of the great plains grassland to take up the qualities of the settlers in general, followed by a discussion of the trapper, trader, cattle man and plow farmer.

II. THE SETTLERS, THEIR ORIGIN, CHARACTER AND INDUSTRIAL PREJUDICES

The civilization of western Europe, source of the settlers on the plains, was developed chiefly in deciduous forest areas. Descriptions of Europe about 1400, however, state that there were partial clearings around the greater centers of population, that is, adjacent to such cities as Paris, Vienna and London, but great stretches of unmodified forest remained. Soon after this settlers began coming to the shores of what is now the United States from the oak and beech forests of the other side of the Atlantic. The most successful were those who landed in deciduous forest similar to that of Europe.

(1) *Physiological and Psychological Characteristics:* In general, the preference for forests on the part of the white man of western Europe is based both on his psychological and physiological qualities. Physiologically, he is not well adapted to long periods of exposure, either to the full heat of summer or to the cold of winter. He is not comfortable without shade in summer and in winter he is unable to cope with the climate without self-devised protection. To meet the physiological requirements of winter, he very early developed the art of building houses from forest materials. His difficulty with the cold was not wholly alleviated with the shelter; he found it necessary to have added warmth during extremely cold periods by the use of fire. This required fuel and the forest provided for this need, too.

These requisites against the extremes of summer and winter do not express all the white man's innate preference for forest conditions. He is, evidently, physiologically adapted to the deciduous forest climate as

regards population size and reproductive capacity. Huntington[6] has shown maps of the white man's energy in which the areas of highest vigor are largely in deciduous forest climate. Furthermore, since large populations of plants and animals occur in most favorable conditions, the same principle may be expected to apply to man. Figs. 1A and 1B show the locations of the *deciduous forest* of North America, dense population and high energy.

There is further evidence of man's preference for forest in the details of arrangements about his abode, since he locates his dwelling at the edge of a woodland or leaves a grove around it, so he may alternate exposure to sun and shade. This characteristic is made evident about every dwelling and farmstead. Trees are regarded as almost essential, and shrubs and vines are cultivated in connection with nearly every dwelling.

After the eastern part of our continent had been occupied, there was a gradual shifting westward into

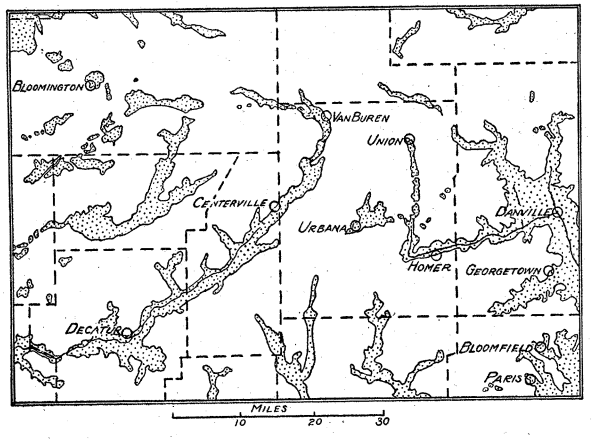

FIG. 2. East central Illinois villages about 1836, showing the location of early settlements at the edges of wooded areas. Urbana and Bloomington are beside small groves at some distance from streams large enough for the use of the canoe.

the parkland areas which were characterized by groves of trees and trees along streams. There were rather large stretches of prairie between them in Illinois, and still larger stretches in Iowa and eastern Nebraska. If one looks at the location of the early settlements, it appears that but two things were considered: (1) the possibility of canoe transportation and (2) the presence of timber. The second fact is brought out when one studies the location of the earliest settlements in central Illinois. In this parkland area, even though streams large enough for canoeing were not present, settlements were found near large groves. The Champaign County city of east central Illinois (Fig. 2), where this paper was written, had its beginning in a triangular grove of trees covering about fifteen square miles but not traversed by streams of sufficient size to be of much importance as a means of transportation. In this county most other early towns were located either near woodland, on streams, or in isolated groves.

In general, the early settler avoided the prairies; at first in part for the reason that he thought they were not fertile because they were treeless. As his experience increased, there were added to this reason the menace of the prairie fires and the terror of winter storms. One venturesome pioneer went two miles south of the Urbana grove and built his home on a high prairie ridge against warnings from other settlers who said he would suffer from heat, cold and wind, and be unable to maintain himself in such a situation. The pioneers disliked the bleak open spaces. This is emphasized by the conditions imposed on settlers at the extreme eastern edge of the larger open stretches of grassland, where lands were given out to those who would plant a certain number of trees. These were called timber claims. Remnants of such groves may still be seen in the northeastern part of the plains states. The general public philosophy has been that the only kind of natural vegetation of value is forest. This has led to the idea that the planting of trees is a remedy for all sorts of ills, even under conditions where trees will not reproduce, as was the case of the "shelter belt" as originally proposed for the eastern edge of the Great Plains.

(2) *Land Ready for the Plow and the Cow.* Man was unable to conquer the forest except on a very small scale until steel was available to make axes and saws, and chains with which to move the fallen trees. The American Indian had made clearings but, without steel, had been able to do so only on a very small scale. Upon arrival in America, the settlers found that the removal of the forest to provide areas for the growth of plants used as food and to provide concentrated forage for domesticated animals was a colossal task. This can hardly be realized by those who have not experienced it. It was only with titanic labors that the early settler, single-handed, cleared the land of timber. When all was ready, a "brush-burning bee" or "fallow burning" was organized, and most of the neighbors were present to assist. Then followed the first crop of wheat on the new land, cut, even in recent years, with a scythe or sickle. There was the continued fight against sprouts from still-living roots. The "grub axe" and "bush hook" were implements in regular use on a new clearing over a period of years. Sprouts had to be grubbed out and stumps had to be burned or pulled. It required eight or ten years to clear land completely. Blue grass had to be put out to produce verdant pastures, like

[6] Ellsworth Huntington, "Civilization and Climate." Third edition. New Haven. 1924.

those of western Europe, for livestock. Even then there was still the struggle against seedlings along fences and the spread sprouts into the meadows.

With a long experience of this kind as a background—one in which plants had to be combated and in which abundant rains kept grasses green and readily replaced, it is not strange that deciduous forest man should have erred in the grassland. With no knowledge whatever of the efficient set of checks and balances in a grassland fauna, those who entered the drier plains saw luxuriant grasses being cropped by bison and antelope. They further saw a great resource, a vocation without the hard labor of clearing land—namely, the raising of cattle which would only have to be herded together and driven east.

There was the further argument that herbaceous growth died down in autumn and came to naught—no doubt intended by divine providence for man's livestock. The stockman definitely failed to make any adequate provision for a seed supply from the grasses; all plants were clipped as close as possible by cattle. Seed, a necessity for replacement of plants, was forgotten, at least by the majority.

(3) *Rise and Decline of the Cattle Industry.* The cattle industry originated in the southern tip of Texas between the Nueces and Rio Grande Rivers. English-speaking cattlemen readily took up the Spanish horse and lariat method of caring for cattle. To complete the system of operation the "round up" was introduced. According to Webb[7] this practice originated in the mountains of Kentucky and Virginia where cattle were allowed to run wild and whence many settlers came. Branding came in as a necessity. Cattle were often driven from one range to another or to market. There were perils and hardships in the "drives." The lack of water caused stampedes of thirst-crazed animals. Andy Adams refers to the bleached bones of men and animals along the trail (see Webb, page 266) resulting from stampedes and other perils. The "cowboys" of Austin's Anglo-American colony began driving cattle from their area in 1837.

The tall grasses of the eastern edge of the grassland withstood cropping better than those of the drier areas farther west, but to newcomers it made no difference. Stock raising on these ready-made pastures temporarily became one of the great industries of the west. There was no plowing, no rush of the harvest season and no dust of threshing. Books with such titles as that of Brisbin's[8] "Beef Bonanza; or, How to Get Rich on the Plains" indicates this state of mind. Many a trapper and adventurer turned his attention to this industry with knowledge of neither grasses nor animal husbandry. However, the cattle business grew rapidly during about forty years, and worked northward from Texas and westward from the Mississippi Valley. By 1870, the projected railroads and much general advertising had resulted in a large westward migration of farmers as well as cattlemen. Overgrazing doubtless began to be evident in some localities about this time. The wiser had tried to save the range through summer grazing in high altitude and winter grazing in low altitude.

The encroachment, by farmers and newly arriving cattlemen, upon the ranges came in spite of strong defensive measures such as those taken by the stock associations and the boycotts, against newcomers. Even the much-hated sheepmen established themselves in some places. Sheep had been fully advertised as well as cattle. The following, which comes from James Brisbin's "Beef Bonanza," indicates this: "In one flock of over 2,000 head, on the Laramie Plains, only two sheep died during the last winter. Of Moore & Brother's flock, consisting of over 10,000 head, only eight had died up to February first. All were fat, and mutton being killed every day, although the sheep had not had a mouthful to eat except the natural grass." Their destructiveness of grass and range is, however, indicated by the fact that almost any mild cattle rancher would cut the throats of sheep that came too near to his grazing lands.[9]

The 1936 Report of the Great Plains Committee, "The Future of the Great Plains," states: "About 1880 there developed a boom in the cattle industry characterized by ownership of large herds by companies financed chiefly by outside, generally European capital. The number of cattle increased rapidly, and soon the range was fully stocked." By 1882, the boom was at its height, and by 1885 the grass was so reduced that either a drought or a hard winter could bring disaster. Disaster did come, first in the form of a severe winter, and then in the form of drought. The winter of 1886–87 was unusually severe, and large numbers of cattle perished. Bad winters and prolonged drought (1886–93) terminated the large cattle "outfits" on the open range. The overgrazing accompanying the boom was followed by a severe grasshopper outbreak felt in the lower Missouri Valley.

Overgrazing destroyed the original character of much of the eastern portion of the grassland area and has continued and extended westward.[10] In areas where shrubs, cacti, etc., occur on rough rocky ground and unfavorable soil, in scattered spots over the grassland, these coarse plants spread into the over-

[7] W. P. Webb, "The Great Plains." Ginn and Company. 1931.

[8] James S. Brisbin, "The Beef Bonanza; or, How to Get Rich on the Plains." Philadelphia. 1880.

[9] H. C. Hanson, *Scientific Monthly*, 46: 230–241. 1939.

[10] J. E. Weaver, *Am. Jour. Bot.*, 12: 502–509, 1925.

grazed area and further reduce the water available for the already reduced and cropped grasses and other forage plants. Sage-brush, rabbit-brush, prickly pear (Opuntia) and other cacti are important. Sage-brush is especially important in this respect in northern regions: overgrazing is responsible for much of the so-called sage-brush desert. In southern regions cacti such as staghorn opuntias and shrubs as Larrea, Franseria and various other coarse plants play an important role and favor the invasion of the larger rodents which intensify unpalatable plant invasion. Moderately grazed grasses are able, however, to steal the water from the invaders and kill them out again.

The increase in rodents which results from the destruction of their enemies hastens the depletion of grasses because some rodents use the grasses just as the cattle do. Some rodents are favored by overgrazing; grasshoppers are also favored and may take further toll from the depleted grasses.

In addition to invasions by coarse plants, small trees have behaved similarly and had similar effects. For example, the cattle business of the United States had its beginning in the gulf coast tallgrass prairie. This is an area almost universally mapped as mesquite —chaparral or savannah and regarded by many as having been that type before the white man came to the area. On the contrary, since cattle eat the mesquite beans and fail to digest them, they spread the seed widely and may be responsible for the entire savannah. It is well known that the mesquite has been spread from south central Texas into west central Oklahoma by this method. The effect of the mesquite trees ranges from a slight depreciation of the grazing value of an area, to almost complete elimination of the grasses.

(4) *The Development of Crop Farming.* Cattle ranching and farming within enclosures made possible by the invention of barbed wire replaced the cattle outfits. This step was aided by the introduction of the wind mill to pump stock water from wells.[7] The transition was nearly completed by 1895. In general, homesteaders contributed to the difficulties of the cattlemen. Covered wagons swarmed over the land, land prices rose, and the ranchman cut up another pasture which he turned over to the farmers, mostly on credit.

As homesteaders increased, the plow turned more and more land wrong side up each year. Sometimes crops were good, and sometimes poor or indifferent. Webb described their plight as follows:

> A few wet years, and the farmers all make bountiful crops of wheat, forage, and even of corn. They wrote "back East" to tell their brothers and sisters and friends about it. Finest land in the world! Plenty of rain; no "grubs" to dig out of the soil. Land to be had for one-fifth of what they ask for that worn-out land in the East. Good health, no chills, no fever, no doctor's bills. And, besides, the country is "getting more seasonable." Always that fiction, the expression of a vain hope, asserted itself in the fat years of the West. Then came the drought, and the covered wagons stole away, taking their occupants back East to the cotton patches and cornfields or shops of their former neighbors, there to become tenants or wage-earners, their spirits crushed, fortunes gone.

While on the plains, each of these settlers also plowed some land, killed some predator enemies of rodents and left the plains in a worse condition than when he arrived.

(To be concluded)

OBITUARY

IN MEMORY OF CHARLES E. SANBORN

IN the passing on July 5, 1944, of Charles Emerson Sanborn, formerly professor of entomology and head of the department of entomology, Oklahoma Agricultural and Mechanical College, the State of Oklahoma and the nation has lost a highly esteemed citizen and scientist.

Ten years of intimate personal association with Professor Sanborn on our anaplasmosis project was a rare privilege. The many field trips, laboratory contacts, conferences and experimental procedures brought to light the true character of the man. He was a loyal and true friend. His interests in human endeavor were legion. Many a young lad received a deeper individual insight into the realm of natural agencies through him, and he contributed much to the Boy Scouts along these lines.

Professor Sanborn was an untiring worker and a keen observer in the field of applied science. Well do I recall his observations on the mating instincts of the horse-fly (*Tabanus sulcifrons*) during the early hours one summer morning at Girard, Kansas. He was awakened just at the brink of dawn by an incessant buzzing sound, and my attention was called to the air being literally alive with huge swarms of these insects. Within a short period, when the sun began to shine, but few of the flies were to be seen.

On other occasions his keenness of observation were noted in calling my attention to swarms of flying ants on the distant horizon. Only a trained observer would discern such phenomena.

In our quest for the collection of ticks, many hours and nights were spent in looking for new species or particular kinds of ticks for experimental use in the