

Rangelands of the Great Plains Before European Settlement

Richard H. Hart and James A. Hart

"Elysian Fields" or "Barrenness, Inhospitability, and Despair"?

A couple from the East stopped at our Central Plains Experimental Range near Nunn, Colorado and asked one of our technicians, "What did this country look like before the white man came?" He grinned and answered "You mean before or after the 6 million buffalo came through?" These two questions illustrate two disparate views of the Great Plains before European settlement, before the pioneers and the trail herds. Much of the conflict over what the Plains should look like now is rooted in disagreement over what they looked like then.

The first European impressions of the Plains were recorded in journals of trappers, traders, explorers, and naturalists from the late 16th to the mid-19th centuries. What were the Plains like when they saw them? Were they "Elysian fields of tremendous areas of luxuriant grass" (Fremont 1845) or were they "enormous plains which in winter are white with snow and in summer are gray with a saline alkali dust [which] preserve the common characteristics of barrenness, inhospitability, and despair" (Doyle 1930)? Were they covered with grass up to a horse's belly or higher, or were they covered with short grass showing the effects of centuries of uncontrolled grazing by bison, elk and other native herbivores? The question will not be settled by appeals to ecological theory or special pleading by the friends or foes of the livestock industry. We must turn to first-hand eyewitness accounts of those early travellers on the Plains. Frequently, we will quote directly from their journals and official reports, to avoid any possible appearance of bias

in a paraphrase or synthesis of their comments. Here, in those early travellers' own words (and their own spelling), is what they saw.

It's Been Shortgrass for a Long Time

Grass to a horse's belly or taller was characteristic, not of the Great Plains, but of the tallgrass prairie to the east. In 1601, Oñate crossed the Plains to the tallgrass prairie on the lower

Canadian River (Figure 1). He described a village of "More than twelve hundred houses...surrounded on all sides by fields of maize...in many places the grass was high enough to conceal a horse" (Bolton 1916).

But the early explorers of the Great Plains agreed that, then as now, they were dominated by short grasses; blue grama and buffalograss in the north, mesquite or galleta grass in the south. Coronado, in 1540-42, led the first party of Europeans to penetrate the

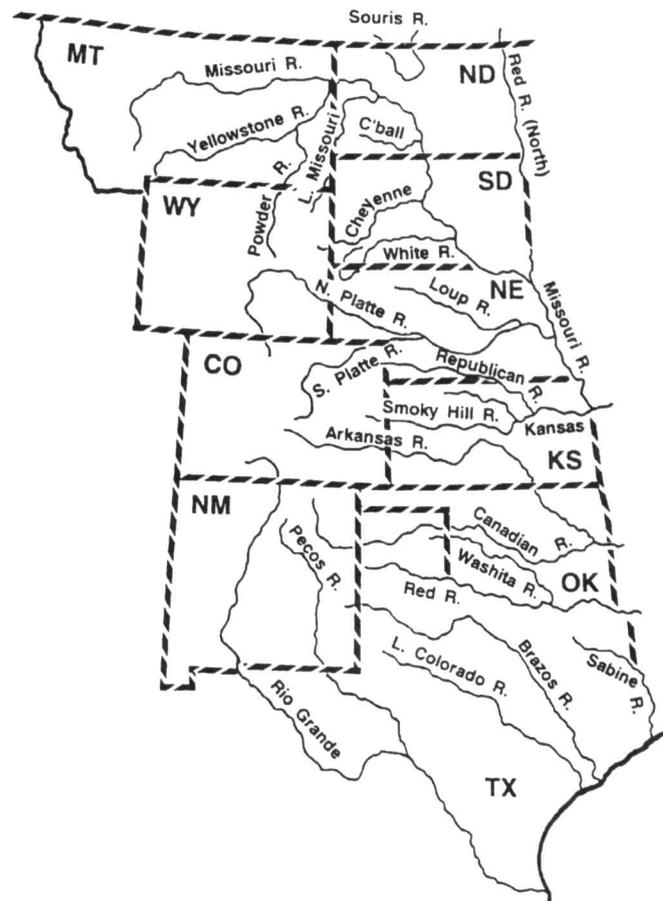


Fig. 1. The rivers of the Great Plains were pathways for exploration.

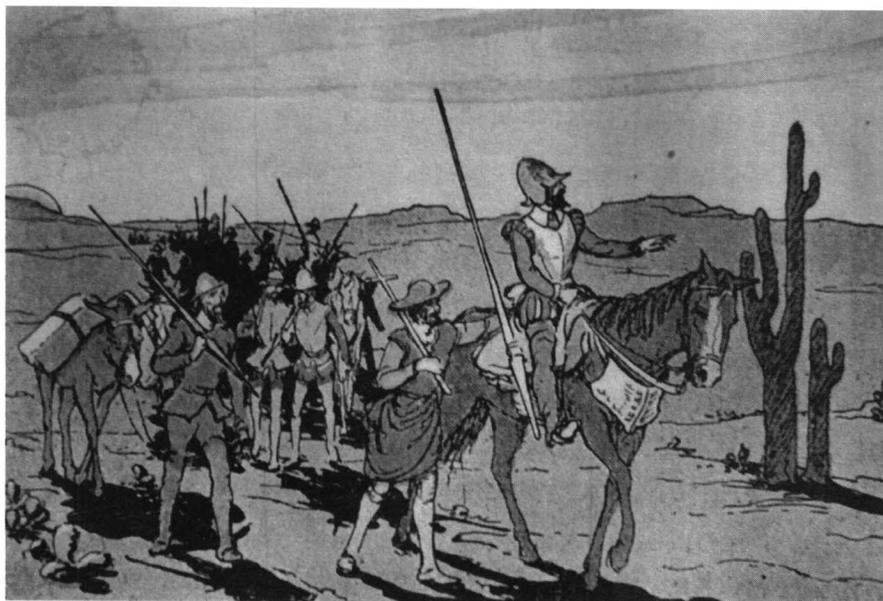


Fig. 2. The original caption of this illustration reads "Coronado and his band of courageous followers wandering over the burning sands of the great Southwest Desert in search of fabled cities and gold and gems" (Barker et al. 1934). However, the expedition's journal of 1541 recorded not deserts but grasslands where "The grass grows tall near the lakes; away from them it is very short, a span or less..." (Castañeda 1966).

shortgrass country of the Great Plains (Castañeda 1966); De Vaca (Bandelier 1905), De Soto (Hudson 1993), and La Salle (Joutel 1962) had only skirted the southern fringes of the Plains. Coronado's party may have travelled as far as Kansas from the Spanish settlements in New Mexico, although Donoghue (1929) maintains Coronado never got out of Texas. Castañeda wrote "The country we passed through is spacious and level. The grass grows tall near the lakes; away from them it is very short, a span or less..." (Figure 2). Although he is describing the southern Plains, the aspect was very much the same from north to south.

Trudeau, a trader on the upper Missouri in 1803–1805, described "Vast and high prairie, separated from the river by low and humid plains, present to the eye a monotonous expanse...small arid hills, the greater part bare or covered with short grasses" (Abel 1921). In 1805, Francois-Antoine Larocque, Charles McKenzie, David Thompson, and Alexander Henry, who we'll encounter later, were fur traders with the Northwest Company, stationed at the Mandan vil-

lages on the Missouri just below present-day Lake Sakakawea. From the Mandan villages, Larocque travelled up the Little Missouri and the Powder, along the front of the Bighorn Mountains to the present site of Billings, Montana, then returned down the Yellowstone and the Missouri to the villages. He complained "It is amazing how very barren the ground is between the Powder River and the lesser Missouri...Our horses are nearly starved" (Wood and Thiessen 1985).

James Pattie (1833), a traveler and teller of tall tales from Kentucky, grumbled about the hard surface of the shortgrass prairie. On the Platte in 1824, he wrote "The plains are covered with a short, fine grass, about four inches high, of such a kind, as to be very injurious to the hoofs of animals..." Pattie also told of packs of hundreds of wolves, "white as snow and big as sheep," and reported about three horrendous Indian fights per week. In 1839, a Swiss traveler named Wislizenus (1912) found "...buffalograss...a very short, delicate grass, growing in isolated bunches ..." as far east as Grand Island.

John C. Fremont (1845) was on the Republican in 1843, 8 days' travel above the mouth of the Smoky Hill at about the present-day Kansas-Colorado border, and reported "Among a variety of grasses which today made their first appearance, I noticed...buffalograss....", and later mentions "...the short sward of the buffalo grass..."

William Franklin (1979), on the Platte in 1845 with Col. Stephen Kearny's expedition, wrote "...there was scarcely any grass on the hills but the buffalo grass and that was parched by the sun." Phillip St. George Cooke and Henry Carleton also accompanied Kearny up the Platte and down the Arkansas in 1845. Cooke (1857) commented "the buffalo has been before us, but we have found some scant grazing;—it is buffalograss,—very backward, and looks like curled gray horsehair..." and echoes Pattie "...its sod is a near approach to wooden pavements."

Randolph Marcy (1850), in the Texas Panhandle in 1849, reported "Not a tree, shrub, or any other object, either animate or inanimate, relieved...the dreaded 'Llano Estacado'. ...The only herbage upon these barren plains is a very short buffalo grass." In 1852, Marcy (1938) wrote "The grass upon the Staked Plain is generally a very short variety of mezquite, called buffalo-grass, from one to two inches in length." He concluded "The range of the grama grass, so far as my observations have extended, is bounded...on the east by about the meridian of 98° west longitude..." Marcy thought well of the nutritional qualities of short grass, describing it as "most excellent forage for animals" and describing "...a luxuriant sward of nutritious mezquite grass, which affords the very best pasturage for animals..." along the Washita River in 1852 (Marcy 1938). George McClellan, who was to command the Army of the Potomac in the Civil War until he exhausted Lincoln's patience (twice), accompanied Marcy, who later became his chief of staff and father-in-law.

The military types seldom had the knowledge needed for extensive botanizing, and tended to mention only the showier forbs to the neglect of the grasses. James Malin (1961), geographer and ecologist at the University of Kansas, snickered at Fremont's comment about "...hunting plants among the grass" (Fremont 1845). The terms buffalograss, grama, and mezquite grass were used quite interchangeably for the short grasses. Finally, differences in the grass species recorded by the various expeditions may reflect differences in location and season, as well as differences in botanical knowledge. Stephen Long and G.K. Warren, of Long's Peak and Gettysburg fame respectively, were among the better botanists and recorded most of the major grass species still present on the Plains.

The military journalists seldom mentioned the taller but less-abundant mid-grasses such as western wheatgrass, needleandthread, and sideoats grama. But they were there, then as now; better-trained naturalists identified them (Table 1). Absence of these grasses indicates serious overgrazing, but they return with better management. In 1867, railroad man W. A. Bell

(1965) wrote of the country west of Salina, Kansas; "...as settlers advance, and domestic herds take the place of the big game, the coarser, more vigorous, and deeper-rooted grasses destroy buffalograss and take its place."

Prickly pear cactus is sometimes regarded as an indicator of overgrazing by livestock, but it was present before a cow or a sheep ever saw the Great Plains. Prickly pear was recorded up and down the Plains from 1804 by Larocque (Wood and Thiessen 1985) to 1849 by Stansbury (1852). Lewis and Clark (1983), on the upper Missouri in 1805, recorded "The prickly pear is now in full blume and forms one of the beauties as well as the greatest pests of the plains" (Figure 3). On the South Platte just above the forks, the Long expedition found that "Prickly pears became more and more abundant...they occurred in such extensive patches as considerably to retard our progress, it being wholly impracticable to urge our horses across them" (James 1823).

Grasses which appear on heavily-grazed rangeland or rangeland disturbed by the activities of rodents also were present (Table 1). These grasses, such as foxtail barley, are currently

regarded as indicators of mismanagement, but in the 19th century indicated heavy grazing by bison or rodent disturbance.

There Were a Lot of Bison

There certainly were a lot of bison; not the 60 million often cited, but probably 15 or 20 million (Cushman and Jones 1988, Shaw 1995) or as many as 28 to 30 million (Flores 1991). Travellers' tales of the great herds are so well known it is unnecessary to repeat them here (Figure 4).

Bison, on occasion, grazed the prairie vegetation right into the ground. Hornaday (1889) reported that buffalo "at times so completely consumed the herbage of the plains that detachments of the United States Army found it difficult to find sufficient grass for their mules and horses."

Carleton (1943), on the Platte in 1845, wrote "The grass as we proceeded seemed to grow poorer and poorer...not enough forage on a mile square...to have furnished even one squadron" [about 100–120 horses]. Some of the forage had probably been eaten by the horses and oxen of emigrant parties on the Oregon Trail.

Table 1. Grasses collected or recorded, 1810–1867, on the Great Plains.

| Species | Reported by ¹ | | | | | | |
|--|--------------------------|--------------|--------------|-------------|--------------|--------------|--------------|
| | Brad 1810 | Long 1819 | Nutt 1819 | Max 1832 | Frem 1842 | Warr 1856 | Bell 1867 |
| Shortgrasses | | | | | | | |
| Blue grama | | + | + | + | | + | + |
| Buffalograss | | + | | + | | + | + |
| False buffalograss | + | | | | + | + | |
| Mesquitgrass (galleta) | + | | | | + | + | |
| Midgrasses | | | | | | | |
| Needle-and-thread | | + | | + | | + | |
| Other needlegrasses | + | + | | | + | + | |
| Western wheatgrass | | | + | | + | | |
| Sideoats grams | + | + | + | | | | + |
| Grasses of heavily-grazed or disturbed rangelands | | | | | | | |
| Annual barley | + | + | | + | + | + | |
| Annual brome grass | | + | | | + | + | |
| Bottlebrush squirreltail | | + | | | | | |
| Dropseeds | | + | | | | + | + |
| Red threeawn | + | | | | + | + | |
| Other threeawns | | + | + | | | | + |
| Sandburs | | + | | | | + | |
| Sixweeks grass | | + | + | | | + | |
| Tumblegrass | | + | | | | | + |

¹Brad = Bradbury (1819), Long = Long (James 1823, Goodman and Lawson 1995), Nutt = Nuttall (1979), Max = Maximilian (1843), Frem = Fremont (1845), Warr = Warren (1875), Bell = Bell (1965).



Fig. 3. Prickly pear cactus was present before a cow or sheep ever saw the Great Plains. Lewis and Clark (1983), on the upper Missouri in 1805, recorded "The prickly pear is now in full blume and forms one of the beauties as well as the greatest pests of the plains."

However, not too many parties had used the trail by 1845; only 5,000 Americans were living in the Oregon country by that year (Current et al. 1971). Trying to decide whether bison or emigrant livestock decimated the forage illustrates the difficulty of defining "before European settlement."

Less well known are the other impacts of bison and other grazers on the Great Plains. Vermont lawyer Thomas Farnham somehow contrived to go from Independence, Missouri to Oregon via the Santa Fe Trail, then up the Front Range, over the Rockies into Brown's Hole, and then along the North Platte to the Oregon Trail. He commented (1841) that the prairie along the Arkansas River in 1839 was "continually crossed by deep paths made by the buffalo..." Prince Maximilian of Wied (1843) observed in 1833 "All over the plain [in present South Dakota] there were deeply trodden paths of the buffaloes" and "Elks and deer had traversed the prairie in all directions and trodden many paths to the river." I'm not sure how he told buffalo paths from those of "elks and

deer," but he was a pretty good plainsman for a middle-aged German city feller, so maybe he could. The paintings of Karl Bodmer, who accompanied Maximilian, are among the best records of the early 19th century Plains.

At even this early date, the commercial exploitation of bison by both European settlers and Native Americans was well established. Maximilian reported "The consumption of this animal is immense in North America...In a recent year, the [American] Fur Company sent 42,000 of these hides down the river...Fort Union alone consumes about 600 to 800 buffaloes annually, and the other forts in proportion. The numerous Indian tribes subsist almost entirely on these animals [and] sell their skins after retaining a sufficient supply for their clothing, tents, & c..."

Bison were great travellers, but were they truly migratory? Charles Goodnight (Haley 1936) told a story which casts some doubt on this. The spring of 1867 was very dry in the Texas Panhandle, and bison herds

gathered on the Little Colorado in such numbers that they had eaten the country clean. Goodnight said, "They had remained until the grass was gone, and had died from starvation by thousands and thousands. The dead buffaloes, which extended for a hundred miles or more, were so thick they resembled a pumpkin field..." Although there was still good grass on the Rio Concho, 30 miles across the divide to the southwest, the bison had stayed on the Colorado.

The impact of bison on water quality will be discussed later. Regardless of impact, bison were an essential component of the Plains ecosystems and one of the factors, along with fire and climate, which shaped the plant communities of the Plains (Larson 1940, Ellison 1960).

Little Wood and Less Water (or Vice Versa)

Water was scarcer than grass on the uplands. The smaller streams were often dry; Maximilian (1843) found "All the small rivers were completely dried up" by mid-July, 1833, near the junction of the Milk and Missouri Rivers.

The larger rivers usually contained water, but the quality of water in streams of all sizes was highly variable. Lewis and Clark commented that the water of the Poplar River in Montana was "transparent, it being the first of this description that I have yet seen discharge itself into the Missouri", but the Yellowstone was "turbid" (Lewis and Clark 1983). Botanist John Bradbury (1819) reported the Cannon-ball was "muddy." Thomas Nuttall, the first naturalist to explore the Arkansas River in 1819, found the Arkansas and the Canadian "red and muddy" (Nuttall 1979). James Hildreth and Hugh Evans accompanied Col. Henry Dodge's expedition in 1834; Hildreth (1836) described the Washita as "of a muddy red color." Edwin James (1823), with the Long expedition, wrote that the water of the upper Canadian was "...mixed with so large a quantity of red earth, as to give it the colour of florid blood." Captain Howard Stansbury led a military party



Fig. 4. *Bison were an essential component of the Plains ecosystem, and had great impacts on vegetation, microtopography, and water quality.*

across the Plains to Utah, where they mapped the shores of the Great Salt Lake. He noted in July of 1849 "...the water of the South Platte was perfectly opaque with thick yellow mud" (Stansbury 1852).

Alexander Henry may be responsible for the original muddy river story. He wrote in 1806; "The water of the Missouri is so impregnated with earth...that a stranger would scarcely venture to drink it...In the winter...when the water is not so terribly thick, it is not to the liking of the natives, and they frequently mix a certain quantity of clay with the water they drink. In the spring, when the ice drifts down, the water is very thick and muddy, and quite to their taste" (Coues 1897).

Not only ice drifted down in the spring. MacKenzie wrote in 1804 "...in the Spring both sides of the River are in several places covered with rotten carcasses and Skeletons of Buffaloes, Elks & c..." (Wood and Thiessen 1985). The journal of Lewis and Clark (1983) for 9 April 1805 relates "...found a number of carcasses of the Buffalo lying on shore...lodged on shore by the high water when the river broke up..." In 1810 botanist James Bradbury (1819) "began to notice...the great number of drowned buffaloes that were floating on the Missouri river; vast numbers of them were also

thrown ashore, and...on the points of islands." Maximilian (1843) in 1832 counted "...1,800 and more of the bison's dead bodies...in one place."

Bison adversely affected water quality in all seasons. "Bisons...were seen, coming in from every quarter to the stagnant pools...in the channel of the Canadian river. The water of these was of course too filthy to drink" (James 1823). Earlier, James had written "When Fountain Creek [near present Fountain, Colorado] began to rise, it was soon covered with such a quantity of bison's dung...that the water could scarcely be seen." Farnham (1841), between the Little Arkansas and the Arkansas in 1839, wrote; "The water—disgusting remembrance! There was none, save what we scooped from the puddles, thick and yellow with buffalo offal." In the Texas Panhandle in 1852, Marcy (1938) "...encamped at a small pond, containing a liquid which we were obliged to make use of, but it had more the appearance of the drainings from a stable-yard than water."

Wood, like grass and water, was scarce except along the streams, and was not always plentiful there. "For the space of six hundred miles, we may be said to have been deprived of the benefits of two of the elements, fire and water...we had no wood or veg-

etables of any kind wherewith to kindle a fire for cooking. We were absolutely compelled to dry the dung of the buffalo as the best article we could procure for cooking..." (Wyeth 1833). Young Jamie Wyeth was unhappy because the West wasn't nearly as much fun and lots harder work than he had anticipated when he signed on with Uncle Nathaniel's expedition. Larpenteur (1898), on the Platte in 1833, wrote; "...there was no wood to be found about camp, and all the fuel we could obtain was the stalks of some large dried weeds, the wild sunflower..." Larpenteur was described by his editor as a reliable observer but "never on good terms with English orthography and syntax".

Along the Platte, wood was scarce in 1845; Carleton (1943) wrote "The men wading across to a small Island for the night's supply of wood...there being no timber upon the main land..." "Other streams, once bare of trees, now are well wooded. Cousin Charlie Fremont (actually it's his wife Jessie Benton Fremont that's my kin) was somewhat of a flake but he had learned to determine latitude and longitude at West Point so he usually knew exactly where he was. He records (1845) that they found "no wood" on Crow Creek just below the present site of Cheyenne on 13 July 1842 and cooked their dinner over a buffalo chip fire, but trees are plentiful along the creek today (Figure 5).

Along the Platte near Kearney, Nebraska, trees were rare as recently as 1938 (Johnson 1994), although the action of ice may have been more important than fire in reducing tree stands. Trees had increased greatly by 1986.

The Missouri was bordered by timber or brush for much of its length, although the surrounding prairie was treeless. A couple of weeks above the Mandan villages on the Missouri River in 1805, Lewis and Clark (1983) enjoyed "A most delightful view of the country, the whole of which except the vally formed by the Missouri is void of timber or underbrush." They reported timber, mostly cottonwood with an undergrowth of willow, as far as the

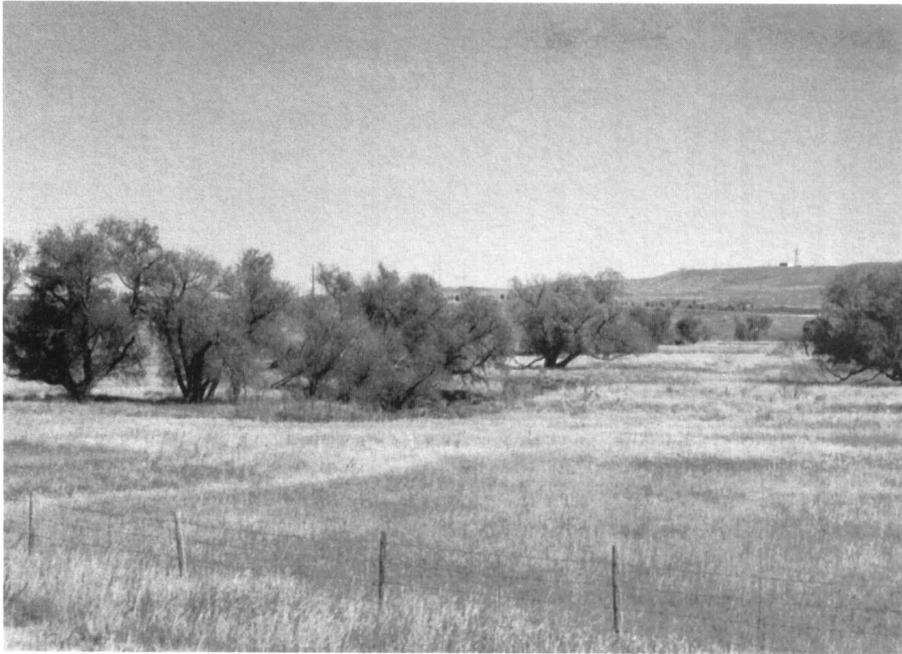


Fig. 5. On July 13, 1842, Fremont (1845) found "no wood" on Crow Creek just below where Cheyenne now stands. Plenty of good-sized willows and some cottonwoods now grow there.

mouth of Milk River, but cautioned that "one fifth of the bottom lands being covered with timber is considered a large proportion."

In 1833, Maximilian (1843) was on the Missouri just above Wheeler, South Dakota, where "...with difficulty we penetrated through the thickets of poplar and willow on the bank...from 300 to 400 paces to the hills...(the valley) was covered with high grass..." The river at the Big Bend was "...bordered with poplars and willows." He noted oaks and ashes at the mouth of Heart River; four days later, "...the wood was beautiful, lofty, and dark..." The mouth of the Yellowstone was "bordered with a fine wood of tall poplars, with willow thickets...tall poplar groves and willow thickets on the banks of the [Missouri] river..."

In 1852, Marcy (1938) reported cottonwood trees along the North Fork of the Red River, the Canadian River, and the Salt Fork of the Brazos, but they became few and far between as his party approached the Llano Estacado. Marcy (1850) reported "good wood, water, and grass" on the banks of the Canadian River near where it now crosses the Texas-Oklahoma state line, but "high rolling

prairie, with no water or wood" on the uplands. Coming back down the Clear Fork of the Brazos, they encountered no trees except mesquite, which were plentiful, until near the present site of Abilene, Texas.



Fig. 6. Fire was ever-present on the Plains, and was probably responsible for the lack of timber along many streams.

On the southern Plains, the presence of mesquite has been credited to overgrazing by livestock, but Marcy (1850, 1938) found "mezquite" trees all across the Texas Panhandle in 1849 and on the North Fork of the Red River in southwest Oklahoma in 1852. He wrote "I have never seen much of this wood [mesquite] above the thirty-sixth degree of north latitude [just below the present east-west boundary between the Texas and Oklahoma Panhandles]; but south of this it appears to increase in quantity and size as far as the 28th degree [the latitude of Corpus Christi, Texas]." Hurtado had reported "many mesquite bushes" along the Canadian River in New Mexico in 1715 (Thomas 1935). In 1806, on his way home from a Mexican jail, Zeb Pike (1966) reported "musquet" between present-day San Antonio and Austin, Texas.

"The Fire Lookd Truly Tremendious"

Fire was ever-present on the Plains (Figure 6). Prairie fires can be fierce; Madson (1982) tells of burning his little patch of prairie and his wife remarking

"You know, when I've painted pictures of prairie fires, I've always made the flames only half as high as they should be..." Lewis and Clark (1983) observed in 1804 "The prairie (near the Mandan villages) got on fire and went with Such Violence & Speed as to Catch a man & woman & burn them to death ...this fire passed us at 8 o'clock and looked truly tremendous."

Also in 1804, Larocque on the Souris River wrote "The plains being on fire to the South West, & the Wind blowing from that Quarter, brought such volumes of smoke, as prevented us from seeing 100 Yds before us...Plains all burnt, except some spots along the Coule'..." and "...the fire appears on both sides of the Missouri just above the mouth of the Little Missouri at a distance West and North" (Wood and Thiessen 1985). Mackenzie, who was with Larocque, "...observed whole herds of Buffaloes with their hair singed--some were blind; and half roasted carcasses strewed our way" (Wood and Thiessen 1985).

In 1810 on the Platte, Bradbury (1819) "...observed in the night the reflection of immense fires, occasioned by burning the prairies..." Stansbury (1852) wrote "...the country along the Platte, for more than three hundred miles, had been completely devastated by these conflagrations, insomuch that our animals came near perishing for want of herbage."

Hugh Evans wrote in 1835; "It is the opinion of many well acquainted with the prairies that the annual fall firing of them by the Indian has caused the scarcity of timber, indeed it appears very natural from the circumstance of their being timber near water courses and wet places where the fire cannot have access..." (Perrine 1927). Franklin (1979) agreed in 1845; "The little Arkansas has high banks like all the timbered streams, and generally those that have low banks are not timbered. The reason of this is, I suppose that the fires reach to the water's edge in the case of the low banks while where a stream has high banks it is intercepted by these banks, and any timber that may be growing on the creek is saved."



Fig. 7. Most of the changes on the Plains have been produced by urbanization and crop agriculture, not grazing.

It'll be Shortgrass for a Long Time (Maybe)

In conclusion, much of the Great Plains before European settlement looked about like it looks now. The vegetation of the uplands has hardly changed; they are still dominated by short grasses, with a seasoning of mid-grasses. The pronghorn have returned, but cattle have replaced bison and elk. Cattle poop in the creek just as bison once did, but they seldom drown in it.

The great fires no longer sweep across the shortgrass, and the hydrology of streams has been changed as water is impounded for recreation and irrigation. As a result, trees have increased along many streams.

The major changes have been produced by crop agriculture and urbanization. Grasslands have been turned "green side down" by the plow and replaced by fields of alfalfa, wheat and grain sorghum (Figure 7). Buffalo wallows have been replaced by circles of irrigated crops, buffalo trails by four-lane interstate highways, and Native American villages by cities. But once away from the cities and the farms, the Plains remain.

The Plains will continue to change, as they have in the past. As recently as 10,000 years BP, the northern Great Plains were forested (Dix 1962, Axelrod 1985). Much more recently, during the drought of 1933-1941, the shortgrass prairie spread 160-240 km into what was previously tallgrass prairie (Weaver and Bruner 1954). In the immediate future, global warming and doubling of the CO₂ concentration of the atmosphere may produce even greater shifts in the Great Plains ecosystem.

Literature Cited

- Abel, A.H. 1921.** Trudeau's description of the Upper Missouri. *Mississippi Valley Hist. Rev.* 8:149-179.
- Axelrod, D.I. 1985.** Rise of the grassland biome, central North America. *Bot. Rev.* 51:163-201.
- Bandelier, F.R. 1905.** The Journey of Alvar Nunez Cabeza de Vaca and His Companions from Florida to the Pacific, 1528-1536. A.S. Barnes & Co., New York.
- Barker, E.C., W.P. Webb, and W.E. Dodd. 1934.** The Growth of a Nation. Row, Peterson and Co., Evanston, IL. (Figure reprinted permission of McGraw-Hill, New York).

- Bell, W.A. 1965.** New Tracks in North America. Horn & Wallace, Albuquerque, N.M.
- Bolton, H.E. 1916.** Spanish Exploration in the Southwest. Charles Scribner's Sons, New York.
- Bradbury, J. 1819.** Travels in the Interior of America, in the Years 1809, 1810, and 1811, vol. V. *In:* R.G. Thwaites (ed.) Early Western Travels, 1748-1846. Arthur H. Clark Co., Cleveland, Ohio.
- Carleton, J.H. (L. Pelzer, ed.) 1943.** The Prairie Logbooks: Dragoon Campaigns to the Pawnee Villages in 1844, and to the Rocky Mountains in 1845. The Caxton Club, Chicago, Ill.
- Castañeda, Pedro de (G.P. Winship transl.) 1966.** The Journey of Coronado. Univ. Microfilms, Ann Arbor, Mich.
- Cooke, P. St. G. 1857.** Scenes and Adventures in the Army or Romance of Military Life. Lindsay & Blakiston, Philadelphia, Penn.
- Coues, E. (ed.) 1897.** The Manuscript Journals of Alexander Henry and of David Thompson 1777-1814. Ross & Haines, Minneapolis, Minn. 2 vols.
- Current, R.N., T.H. Williams and F. Freidel. 1971.** American History: A Survey (3rd ed.) Alfred A. Knopf, New York.
- Cushman, R.C. and S.R. Jones. 1988.** The Shortgrass Prairie. Pruett Publ. Co., Boulder, Colo.
- Dix, R.L. 1962.** A history of biotic and climatic changes within the North American grassland, p. 71-89. *In:* D.J. Crisp, (ed.) Grazing in Terrestrial and Marine Environments. Blackwell Sci. Publ., Oxford, UK.
- Donoghue, D. 1929.** The route of the Coronado expedition in Texas. *SW Hist. Quart.* 32:181-192.
- Doyle, A.C. 1930.** A study in scarlet, p. 13-86. *In:* The Complete Sherlock Holmes. Doubleday & Co., Garden City, N.Y.
- Ellison, L. 1960.** The influence of grazing on plant succession of rangelands. *Bot. Rev.* 16:1-78.
- Farnham, T.J. 1841.** Travels in the Great Western Prairies. Poughkeepsie, New York.
- Flores, D. 1991.** Bison ecology and bison diplomacy: The Southern Plains from 1800 to 1850. *J. Amer. Hist.* 78:465-485.
- Franklin, W.B. (F.N. Schubert, ed.) 1979.** March to South Pass: Lieutenant William B. Franklin's Journal of the Kearny Expedition of 1845. *Engin. Hist. Studies No. 1, Historical Div., Off. Admin Serv., Off. Chief Engin. USGPO, Washington.*
- Fremont, J.C. 1845.** Report of the Exploring Expedition to the Rocky Mountains in the Year 1842, and to Oregon and North California in the Years 1843-44. Gales & Seaton, Washington, DC.
- Goodman, G.J. and C.A. Lawson. 1995.** Retracing Major Stephen H. Long's 1820 Expedition. Univ. Oklahoma Press, Norman, Okla.
- Haley, J.E. 1936.** Charles Goodnight: Cowman & Plainsman. Houghton Mifflin Co., Boston, Mass.
- Hildreth, J. 1836.** Dragoon Campaigns to the Rocky Mountains. Wiley & Long, New York.
- Hornaday, W.T. 1889.** Extermination of the American bison. *Rep. Natl. Museum (1886-1887).* U.S. Govt. Print. Off., Washington, DC.
- Hudson, C. 1993.** Reconstructing the de Soto expedition route west of the Mississippi River: summary and contents, p. 143-154. *In:* G.A. Young & M.P. Hoffman (eds.) The Expedition of Hernando de Soto West of the Mississippi, 1541-1543. Univ. Arkansas Press, Fayetteville, Ark..
- James, E. 1823.** Account of an Expedition from Pittsburgh to the Rocky Mountains, Performed in the Years 1819, 1820, vol. XIV-XVII. *In:* R.G. Thwaites (ed.) Early Western Travels, 1748-1846. Arthur H. Clark Co., Cleveland, Ohio.
- Johnson, W.C. 1994.** Woodland expansion in the Platte River, Nebraska: Patterns and causes. *Ecol. Monogr.* 64:45-84.
- Joutel, H. (D. B. Rutman, ed.) 1962.** A Journal of La Salle's Last Voyage. New York.
- Larpeur, C. (E. Coues, ed.) 1898.** Forty Years a Fur Trader on the Upper Missouri. Ross & Haines, Inc., Minneapolis, Minn.
- Larson, F. 1940.** The role of bison in maintaining the short grass plains. *Ecology* 21:113-121.
- Lewis, M. and W. Clark (G.E. Moulton & T.W. Dunlay, eds.) 1983.** The Journals of the Lewis & Clark Expedition. Univ. Nebraska Press, Lincoln, Neb.
- Madson, J. 1982.** Where the Sky Began: Land of the Tallgrass Prairie. Sierra Club Books, San Francisco, Calif.
- Malin, J.C. 1961.** The Grassland of North America: Prolegomena to its History with Addenda. Peter Smith, Gloucester, Massachusetts.
- Marcy, R.B. 1850.** Route from Fort Smith to Santa Fe. US 31st Cong., 1st Sess., House Exec. Doc. 45:26-83.
- Marcy, R.B. (G. Foreman, ed.) 1938.** Adventure on Red River: Report on the Exploration of the Red River. Univ. Oklahoma Press, Norman, Okla.
- Maximilian, Prinz zu Wied. 1843.** Travels in the Interior of North America, vol. XXII-XXIV. *In:* R.G. Thwaites (ed.) Western Travels, 1748-1846. Arthur H. Clark Co., Cleveland, Ohio.
- Nuttall, T. (S. Lottinville, ed.) 1979.** A Journal of Travels into the Arkansas Territory During the Year 1819. Univ. Oklahoma Press, Norman, Okla.
- Pattie, J.O. (T. Flint, ed.) 1833.** The Personal Narrative of James O. Pattie, of Kentucky. E.H. Flint, Cincinnati, Ohio.
- Perrine, Fred S. (ed.) 1927.** Hugh Evan's journal of Colonel Henry Dodge's expedition to the Rocky Mountains in 1835. *Mississippi Valley Hist. Rev.* 14:192-214.
- Pike, Z.M. (D. Jackson, ed.) 1966.** The Journals of Zebulon Montgomery Pike. Univ. Oklahoma Press, Norman, Okla.
- Shaw, J.H. 1995.** How many bison originally populated western rangelands? *Rangelands* 17:148-150.
- Stansbury, H. 1852.** An Expedition to the Valley of the Great Salt Lake or Utah. Sampson Low, Son, & Co., London.
- Thomas, A.B. (ed.) 1935.** After Coronado. Univ. Oklahoma Press, Norman, Okla.
- Warren, G.K. 1875.** Preliminary Report of Explorations in Nebraska and Dakota in the Years 1855-'56-'57. U.S. Govt. Print. Office, Washington, DC. [Facsimile issued as Schubert, F.N. (ed.) 1982. Explorer on the Northern Plains. *Engin. Hist. Stud. No. 2, Hist. Div., Off. Admin. Serv., Off. Chief Engin., USGPO, Washington, DC.*]
- Weaver, J.E. and W.E. Bruner. 1954.** Nature and place of transition from true prairie to mixed prairie. *Ecol.* 35:117-126.
- Wislizenus, F.A. 1912.** A Journey to the Rocky Mountains in the Year 1839. *Missouri Hist. Soc., St. Louis, Mo.*
- Wood, W.R. and T.D. Thiessen (eds.) 1985.** Early Fur Trade on the Northern Plains: The Narratives of John Macdonell, David Thompson, Francois Antoine Larocque and Charles McKenzie. Univ. Oklahoma Press, Norman, Okla.
- Wyeth, J.B. 1833.** Oregon, or a Short History of a Long Journey from the Atlantic Ocean to the Region of the Pacific by Land, vol. XXI, p. 19-106. *In:* R.G. Thwaites (ed.) Early Western Travels, 1748-1846. Arthur H. Clark Co., Cleveland, Ohio.

Authors are Rangeland Scientist, US Dept. of Agriculture, Agricultural Research Service, High Plains Grasslands Research Station, and student, Laramie County Community College, Cheyenne, Wyo. 82009. They are also father and son.