Tetons. In a sense, the Fort Laramie Treaty marked the height of Sioux political power. Of the 10,000 Indians who attended the conference, the great majority of them were Sioux, Cheyennes, and Arapahos. Sioux threats kept the Pawnees and all but small groups of Crows, Arikaras, Hidatsas, and Assiniboines from coming to Fort Laramie. The Shoshones came, but the Cheyennes attacked their party and part turned back. With the Sioux and their allies so thoroughly dominating the conference, the treaty itself amounted to both a recognition of Sioux power and an attempt to curb it. But when American negotiators tried to restrict the Sioux to an area north of the Platte, Black Hawk, an Oglala, protested that they held the lands to the south by the same right the Americans held their lands, the right of conquest: "These lands once belonged to the Kiowas and the Crows, but we whipped those nations out of them, and in this we did what the white men do when they want the lands of the Indians." The Americans conceded, granting the Sioux hunting rights, which, in Indian eyes, confirmed title. The Sioux gladly accepted American presents and their tacit recognition of Sioux conquests, but, as their actions proved, they never saw the treaty as a prohibition of future gains. After an American war with the Sioux and another attempt to stop intertribal warfare in 1855, Bear's Rib, a Hunkpapa chief, explained to Lieutenant G. K. Warren that the Tetons found it difficult to take the American prohibition of warfare seriously when the Americans themselves left these conferences only to engage in wars with other Indians or with the Mormons.

After the treaty, the lines of conflict on the plains were clearly drawn. The two major powers in the area, the Sioux and the Americans, had both advanced steadily and with relatively little mutual conflict. Following the treaty they became avowed and recognized rivals. Within four years of the treaty, the first American war with the Tetons would break out; and by the mid-1850s, American officers frankly saw further war as inevitable. The Sioux, in turn, recognized the American threat to their interests, and the tribes, in a rare display of concerted action, agreed as a matter of policy to prohibit all land cessions and to close their remaining productive hunting grounds to American intrusions. These attempts consistently led to war with the Americans. After a century of conquest the Sioux had very definite conceptions of the boundaries of their tribal territory. Recent historians and some earlier anthropologists contended that Indians never fought for territory, but if this is so, it is hard to explain the documented outrage of the Saones, Oglalas, and Brulés at the cession of land along the Missouri by the Yanktons in 1858. The Tetons had moved from this land decades before and had been replaced by the Yanktons, but from the Teton point of view the whole western Sioux nation still held title to the territory and the Yanktons had no authority to sell it. Fearing that acceptance of annuities would connote recognition of the sale, the Saone tribes refused them, and the cession provoked a crisis on the western plains and hardened Teton ranks against the Americans.

The warfare between the northern plains tribes and the United States that followed the Fort Laramie Treaty of 1851 was not the armed resistance of a people driven to the wall by American expansion. In reality these wars arose from the clash of two expanding powers—the United States, and the Sioux and their allies. If, from a distance, it appears that the vast preponderance of strength rested with the whites, it should be remembered that the ability of the United States to bring

this power to bear was limited. The series of defeats the Sioux inflicted on American troops during these years reveals how real the power of the Tetons was.

Even as they fought the Americans, the Sioux continued to expand their domination of plains hunting grounds, as they had to in order to survive. Logically enough, the tribes the Sioux threatened—the Crows, Pawnees, and Arikaras especially—sided with the Americans, providing them with soldiers and scouts. For white historians to cast these people as mere dupes or traitors is too simplistic. They fought for their tribal interests and loyalties as did the Sioux.

It is ironic that historians, far more than anthropologists, have been guilty of viewing intertribal history as essentially ahistoric and static, of refusing to examine critically the conditions that prompted Indian actions. In too much Indian history, tribes fight only "ancient" enemies, as if each group were doled out an allotted number of adversaries at creation with whom they battled mindlessly through eternity. Historians have been too easily mystified by intertribal warfare, too willing to see it as the result of some ingrained cultural pugnacity. This is not to argue that the plains tribes did not offer individual warriors incentives of wealth and prestige that encouraged warfare, but, as [anthropologist W.W.] Newcomb pointed out, the real question is why the tribe placed such a premium on encouraging warriors. This is essentially a historical question. Without an understanding of tribal and intertribal histories, and an appreciation that, like all history, they are dynamic, not static, the actions of Indians when they come into conflict with whites can be easily and fatally distorted.

Bison Ecology and Bison Diplomacy: The Southern Plains, 1800–1850

DAN FLORES

In bright spring light on the Great Plains of two centuries ago, governor Juan Bautista de Anza failed in the last of the three crucial tasks that his superiors had set him as part of their effort to reform New Mexico's Comanche policy. Over half a decade, Anza had followed one success with another. He had brilliantly defeated the formidable Comanche *nomnekaht* (war leader) Cuerno Verde in 1779, and as a consequence in 1786, he had personally fashioned the long-sought peace between New Mexico and the swelling Comanche population of the Southern Plains. His third task was to persuade the Comanches to settle in permanent villages and to farm.

But the New Mexico governor found the third undertaking impossible. Observers of Plains Indian life for 250 years and committed to encouraging agriculture over hunting, the Spaniards were certain that the culture of the horse Indians was ephemeral, that the bison on which they depended were an exhaustible resource. Thus Anza pleaded with the tribes to give up the chase. The Comanches thought him unconvincing. Recently liberated by horse culture and by the teeming wildlife of the High Plains, their bands found the Arkansas River pueblo the

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governor built for them unendurable. They returned to the hunt with the evident expectation that their life as buffalo hunters was an endless cycle. And yet Anza proved to be a prophet. Within little more than half a century, the Comanches and other tribes of the Southern Plains were routinely suffering from starvation and complaining of shortages of bison. What had happened?

Environmental historians and ethnohistorians whose interests have been environmental topics have in the two past decades been responsible for many of our most valuable recent insights into the history of native Americans since their contact with Euro-Americans. Thus far, however, modern scholarship has not reevaluated the most visible historic interaction, the set piece if you will, of native American environmental history. On the Great Plains of the American West during the two centuries from 1680 to 1880, almost three-dozen native American groups adopted horse-propelled, bison-hunting cultures that defined "Indianness" for white Americans and most of the world. It is the end of this process that has most captured the popular imagination: the military campaigns against and the brutal incarceration of the horse Indians, accompanied by the astonishingly rapid elimination of bison, and of an old ecology that dated back ten thousand years, at the hands of commercial hide hunters. That dramatic end, which occurred in less than fifteen years following the end of the Civil War, has by now entered American mythology. Yet our focus on the finale has obscured an examination of earlier phases that might shed new light on the historical and environmental interaction of the horse Indians and bison herds on the Plains.

In the nineteenth-century history of the Central and Southern Plains, there have long been perplexing questions that environmental history seems well suited to answer. Why were the Comanches able to replace the Apaches on the bison-rich Southern Plains? Why did the Kiowas, Cheyennes, and Arapahoes gradually shift southward into the Southern Plains between 1800 and 1825? And why, after fighting each other for two decades, did these Southern Plains peoples effect a rapprochement and alliance in the 1840s? What factors brought on such an escalation of Indian raids into Mexico and Texas in the late 1840s that the subject assumed critical importance in the Treaty of Guadalupe-Hidalgo? If the bison herds were so vast in the years before the commercial hide hunters, why were there so many reports of starving Indians on the Plains by 1850? And finally, given our standard estimates of bison numbers, why is it that the hide hunters are credited with bringing to market only some 10 million hides, including no more than 3.5 million from the Southern Plains, in the 1870s?

Apposite to all of these questions is a central issue: How successful were the horse Indians in creating a dynamic ecological equilibrium between themselves and the vast bison herds that grazed the Plains? That is, had they developed sustainable hunting practices that would maintain the herds and so permit future generations of hunters to follow the same way of life? This is not to pose the "anachronistic question" (the term is Richard White's) of whether Indians were ecologists. But how a society or a group of peoples with a shared culture makes adjustments to live within the carrying capacity of its habitat is not only a valid historical question, it may be one of the most salient questions to ask about any culture. Historians of the Plains have differed about the long-term ecological sustainability of the Indians' use of bison, particularly after the Euro-American fur

trade reached the West and the tribes began hunting bison under the influence of the market economy. The standard work, Frank Roe's *The North American Buffalo,* has generally carried the debate with the argument that there is "not a shred of evidence" to indicate that the horse Indians were out of balance with the bison herds. Using the new insights and methods of environmental history, it now appears possible systematically to analyze and revise our understanding of nineteenth-century history on the Great Plains. Such an approach promises to resolve some of the major questions. It can advance our understanding of when bison declined in numbers and of the intertwining roles that Indian policies—migrations, diplomacy, trade, and use of natural resources—and the growing pressures of external stimuli played in that decline. The answers are complex and offer a revision of both Plains history and western Indian ecological history.

Working our way through to them requires some digression into the large historical forces that shaped the Southern Plains over the last hundred centuries. The perspective of the *longue durée* is essential to environmental history. What transpired on the Great Plains from 1800 to 1850 is not comprehensible without taking into account the effect of the Pleistocene extinctions of ten thousand years ago, or the cycle of droughts that determined the carrying capacity for animals on the grasslands. Shallower in time than these forces but just as important to the problem are factors that stemmed from the arrival of Europeans in the New World. Trade was an ancient part of the cultural landscape of America, but the Europeans altered the patterns, the goods, and the intensity of trade. And the introduction of horses and horse culture accomplished a technological revolution for the Great Plains. The horse was the chief catalyst of an ongoing remaking of the tribal map of western America, as native American groups moved onto the Plains and incessantly shifted their ranges and alliances in response to a world where accelerating change seemed almost the only constant.

At the beginning of the nineteenth century, the dominant groups on the Southern Plains were the two major divisions of the Comanches: the Texas Comanches, primarily Kotsotekas, and the great New Mexico division, spread across the country from the Llano Estacado Escarpment west to the foothills of the Sangre de Cristo Mountains, and composed of Yamparika and Jupe bands that only recently had replaced the Apaches on the High Plains. The Comanches' drive to the south from their original homelands in what is now southwestern Wyoming and northwestern Colorado was a part of the original tribal adjustments to the coming of horse technology to the Great Plains. There is reason to believe that the Eastern Shoshones, from whom the Comanches were derived before achieving a different identity on the Southern Plains, were one of the first intermountain tribes of historic times to push onto the Plains. Perhaps as early as 1500 the proto-Comanches were hunting bison and using dog power to haul their mountain-adapted four-pole tipis east of the Laramie Mountains. Evidently they moved in response to a wetter time on the Central Plains and the larger bison concentrations there.

These early Shoshonean hunters may not have spent more than three or four generations among the thronging Plains bison herds, for by the seventeenth century they had been pushed back into the mountains and the sagebrush deserts by tribes newly armed with European guns moving westward from the region around

the Great Lakes. If so, they were among a complex of tribes southwest of the lakes that over the next two centuries would be displaced by a massive Siouan drive to the west, an imperial expansion for domination of the prize buffalo range of the Nothern Plains, and a wedge that sent ripples of tribal displacement across the Plains.

Among the historic tribes, the people who became Comanches thus may have shared with the Apaches and, if linguistic arguments are correct, probably with the Kiowas the longest familiarity with a bison-hunting life-style. Pressed back toward the mountains as Shoshones, they thus turned in a different direction and emerged from the passes through the Front Range as the same people but bearing a new name given them by the Utes: Komantcia. They still lacked guns but now began their intimate association with the one animal, aside from the bison, inextricably linked with Plains life. The Comanches began acquiring horses from the Utes within a decade or so after the Pueblo Revolt of 1680 sent horses and horse culture diffusing in all directions from New Mexico. Thus were born the "hyper-Indians," as William Brandon has called the Plains people.

The Comanches became, along with the Sioux, the most populous and widespread of all the peoples who now began to ride onto the vast sweep of grassland to participate in the hunter's life. They began to take possession of the Southern Plains by the early 1700s. By 1800 they were in full control of all the country east of the Southern Rocky Mountains and south of the Arkansas River clear to the Texas Hill Country. Their new culture, long regarded as an ethnographic anomaly on the Plains because of its western and archaic origins, may not be unique, as older scholars had supposed it to be—at least if we believe the new Comanche revisionists. Irrespective of their degree of tribal unity, however, when they began to move onto the Southern Plains with their new horse herds, their culture was adapting in interesting ways to the wealth of resources now available to them.

To the Comanches, the Southern Plains must have seemed an earthly paradise. The Pleistocene extinctions ten thousand years earlier had left dozens of grazing niches vacant on the American Great Plains. A dwarf species of bison with a higher reproductive capability than any of its ancestors evolved to flood most of those vacant niches with an enormous biomass of one grazer. In an ecological sense, bison were a weed species that had proliferated as a result of a major disturbance. That disturbance still reverberated, making it easy for Spanish horses, for example, to reoccupy their old niche and rapidly spread across the Plains. Those reverberations made the horse Indians thrive on an environmental situation that has had few parallels in world history.

The dimensions of the wild bison resource on the Southern Plains, and the Great Plains in general, have been much overstated in popular literature. For one thing, pollen analysis and archaeological data indicate that for the Southern Plains there were intervals, some spanning centuries, others decades, when bison must have been almost absent. Two major times of absence occurred between 5000 and 2500 B.C. and between A.D. 500 and 1300. The archaeological levels that lack bison bones correspond to pollen data indicating droughts. The severe southwestern drought that ended early in the fourteenth century was replaced by a five-hundred-year cycle of wetter and cooler conditions, and a return of bison in large

numbers to the Southern Plains from their drought refugia to the east and west. This long-term pattern in the archaeological record seems to have prevailed on a smaller scale within historic times. During the nineteenth century, for example, droughts of more than five years' duration struck the Great Plains four times at roughly twenty-year intervals, in a long-term dendrochronological pattern that seems to show a drying cycle (shorter drought-free intervals) beginning in the 1850s.

More important, our popular perception of bison numbers—based on the estimates of awed nineteenth-century observers—probably sets them too high. There very likely were never 100 million or even 60 million bison on the Plains during the present climate regime because the carrying capacity of the grasslands was not so high. The best technique for determining bison carrying capacity on the Southern Plains is to extrapolate from United States census data for livestock, and the best census for the extrapolation is that of 1910, after the beef industry crashes of the 1880s had reduced animal numbers, but before the breakup of ranches and the Enlarged Homestead Act of 1909 resulted in considerable sections of the Southern Plains being broken out by farmers. Additionally, dendrochronological data seem to show that at the turn of the century rainfall on the Southern Plains was at median, between-droughts levels, rendering the census of 1910 particularly suitable as a base line for carrying capacity and animal populations.

The 1910 agricultural census indicates that in the 201 counties on the Southern Plains (which covered 240,000 square miles), the nineteenth-century carrying capacity during periods of median rainfall was about 7,000,000 cattle-equivalent grazers—specifically for 1910, about 5,150,000 cattle and 1,890,000 horses and mules. The bison population was almost certainly larger, since migratory grazing patterns and coevolution with the native grasses made bison as a wild species about 18 percent more efficient on the Great Plains than domestic cattle. And varying climate conditions during the nineteenth century, as I will demonstrate, noticeably affected grassland carrying capacity. The ecological reality was a dynamic cycle in which carrying capacity could swing considerably from decade to decade. But if the Great Plains bovine carrying capacity of 1910 expresses a median reality, then during prehorse times the Southern Plains might have supported an average of about 8.2 million bison, the entire Great Plains perhaps 28–30 million.

Although 8 million bison on the Southern Plains may not be so many as historians used to believe, to the Comanches the herds probably seemed limitless. Bison availability through horse culture caused a specialization that resulted in the loss of two-thirds of the Comanches' former plant lore and in a consequent loss of status for their women, an intriguing development that seems to have occurred to some extent among all the tribes that moved onto the Plains during the horse period. As full-time bison hunters the Comanches appear to have abandoned all the old Shoshonean mechanisms, such as infanticide and polyandry, that had kept their population in line with available resources. These were replaced with such cultural mechanisms as widespread adoption of captured children and polygyny, adaptations to the Plains that were designed to keep

Comanche numbers high and growing. That these changes seem to have been conscious and deliberate argues, perhaps, both Comanche environmental insight and some centralized leadership and planning.

Comanche success at seizing the Southern Plains from the native groups that had held it for several hundred years was likewise the result of a conscious choice: their decision to shape their lives around bison and horses. Unlike the Comanches, many of the Apache bands had heeded the Spaniards' advice and had begun to build streamside gardening villages that became deathtraps once the Comanches located them. The Apaches' vulnerability, then, ironically stemmed from their willingness to diversify their economy. Given the overwhelming dominance of grasslands as opposed to cultivable river lands on the Plains, the specialized horse and bison culture of the Comanches exploited a greater volume of the thermodynamic energy streaming from sunlight into plants than the economies of any of their competitors—until they encountered Cheyennes and Arapahoes with a similar culture. The horse-mounted Plains Indians, in other words, made very efficient use of the available energy on the Great Plains, something they seem instinctively to have recognized and exulted in. From the frequency with which the Comanches applied some version of the name "wolf" to their leaders, I suspect that they may have recognized their role as human predators and their ecological kinship with the wolf packs that like them lived off the bison herds.

The Comanches were not the only people on the Southern Plains during the horse period. The New Mexicans, both Pueblo and Hispanic, continued to hunt on the wide-open Llanos [plains], as did the praire Caddoans, although the numbers of the latter were dwindling rapidly by 1825. The New Mexican peoples and the Caddoans of the middle Red and Brazos rivers played major trade roles for hunters on the Southern Plains, and the Comanches in particular. Although the Comanches engaged in the archetypal Plains exchange of bison products for horticultural produce and European trade goods and traded horses and mules with Anglo-American traders from Missouri, Arkansas, and Louisiana, they were not a high-volume trading people until relatively late in their history. Early experiences with American traders and disease led them to distrust trade with Euro-Americans, and only once or twice did they allow short-lived posts to be established in their country. Instead, peace with the prairie Caddoans by the 1730s and with New Mexico in 1786 sent Comanche trade both east and west, but often through Indian middlemen.

In the classic, paradigmatic period between 1800 and 1850, the most interesting Southern Plains development was the cultural interaction between the Comanches and surrounding Plains Indians to the north. The Kiowas were the one of those groups most closely identified with the Comanches.

The Kiowas are and have long been an enigma. Scholars are interested in their origins because Kiowa oral tradition is at odds with the scientific evidence. The Kiowas believe that they started their journey to Rainy Mountain on the Oklahoma Plains from the north. And indeed, in the eighteenth century we find them on the Northern Plains, near the Black Hills, as one of the groups being displaced southwestward by the Siouan drive toward the buffalo range. Linguistically, however, the Kiowas are southern Indians. Their language belongs to the Tanoan group of Pueblo languages in New Mexico, and some scholars believe that the Kiowas of later history are the same people as the Plains Jumanos of early New Mexico history, whose rancherias were associated during the 1600s and early 1700s with the headwaters of the Colorado and Concho rivers of Texas. How the Kiowas got so far north is not certainly known, but in historical times they were consummate traders, especially of horses, and since the Black Hills region was a major trade citadel they may have begun to frequent the region as traders and teachers of horse lore.

Displaced by the wars for the buffalo ranges in the north, the Kiowas began to drift southward again—or perhaps, since the supply of horses was in the Southwest, simply began to stay longer on the Southern Plains. Between 1790 and 1806, they developed a rapprochement with the Comanches. Thereafter they were so closely associated with the northern Comanches that they were regarded by some as merely a Comanche band, although in many cultural details the two groups were dissimilar. Spanish and American traders and explorers of the 1820s found them camped along the two forks of the Canadian River and on the various headwater streams of the Red River.

The other groups that increasingly began to interact with the Comanches during the 1820s and thereafter had also originated on the Northern Plains. These were the Arapahoes and the Cheyennes, who by 1825 were beginning to establish themselves on the Colorado buffalo plains from the North Platte River all the way down to the Arkansas River.

The Algonkian-speaking Arapahoes and Cheyennes had once been farmers living in earth lodges on the upper Mississippi. By the early 1700s both groups were in present North Dakota, occupying villages along the Red and Cheyenne rivers, where they first began to acquire horses, possibly from the Kiowas. Fur wars instigated by the Europeans drove them farther southwest and more and more into a Plains, bison-hunting culture, one that the women of these farming tribes probably resisted as long as possible. But by the second decade of the nineteenth century the Teton Sioux wedge had made nomads and hunters of the Arapahoes and Cheyennes.

Their search for prime buffalo grounds and for ever-larger horse herds, critical since both tribes had emerged as middlemen traders between the villagers of the Missouri and the horse reservoir to the south, first led the Cheyennes and Arapahoes west of the Black Hills, into Crow lands, and then increasingly southward along the mountain front. By 1815 the Arapahoes were becoming fixed in the minds of American traders as their own analogue on the Southern Plains; the famous trading expedition of August Pierre Chouteau and Jules De Mun that decade was designed to exploit the horse and robe trade of the Arapahoes on the Arkansas. By the 1820s, when Stephen Long's expedition and the trading party including Jacob Fowler penetrated the Southern Plains, the Arapahoes and Cheyennes were camping with the Kiowas and Comanches on the Arkansas. The Hairy Rope band of the Cheyennes, renowned for their ability to catch wild horses, was then known to be mustanging along the Cimarron River.

Three factors seem to have drawn the Arapahoes and Cheyennes so far south. Unquestionably, one factor was the vast horse herds of the Comanches and Kiowas, an unending supply of horses for the trade, which by 1825 the Colorado

tribes were seizing in daring raids. Another was the milder winters south of the Arkansas, which made horse pastoralism much easier. The third factor was the abnormally bountiful game of the early nineteenth-century Southern Plains, evidently the direct result of an extraordinary series of years between 1815 and 1846 when, with the exception of a minor drought in the late 1820s, rainfall south of the Arkansas was considerably above average. So lucrative was the hunting and raiding that in 1833 Charles Bent located the first of his adobe trading posts along the Arkansas, expressly to control the winter robe and summer horse trade of the Arapahoes and Cheyennes. Bent's marketing contacts were in St. Louis. Horses that Bent's traders drove to St. Louis commonly started as stock in the New Mexican Spanish settlements (and sometimes those were California horses stolen by Indians who traded them to the New Mexicans) that were stolen by the Comanches, then stolen again by Cheyenne raiders, and finally traded at Bent's or Ceran St. Vrain's posts, whence they were driven to Westport, Missouri, and sold to outfit American emigrants going to the West Coast! Unless you saw it from the wrong end, as the New Mexicans (or the horses) seem to have, it was both a profitable and a culturally stimulating economy.

Thus, around 1825, the Comanches and Kiowas found themselves at war with Cheyennes, Arapahoes, and other tribes on the north. Meanwhile, the Colorado tribes opened another front in a naked effort to seize the rich buffalo range of the upper Kansas and Republican rivers from the Pawnees. These wars produced an interesting type of ecological development that appeared repeatedly across most of the continent. At the boundaries where warring tribes met, they left buffer zones occupied by neither side and only lightly hunted. One such buffer zone on the Southern Plains was along the region's northern perimeter, between the Arkansas and North Canadian rivers. Another was in present-day western Kansas, between the Pawnees and the main range of the Colorado tribes, and a third seems to have stretched from the forks of the Platte to the mountains. The buffer zones were important because game within them was left relatively undisturbed; they allowed the buildup of herds that might later be exploited when tribal boundaries or agreements changed.

The appearance of American traders such as Bent and St. Vrain marked the Southern Plains tribes' growing immersion in a market economy increasingly tied to worldwide trade networks dominated by Euro-Americans. Like all humans, Indians had always altered their environments. But as most modern historians of Plains Indians and the western fur trade have realized, during the nineteenth century not only had the western tribes become technologically capable of pressuring their resources, but year by year they were becoming less "ecosystem people," dependent on the products of their local regions for subsistence, and increasingly tied to biospheric trade networks. Despite some speculation that the Plains tribes were experiencing ecological problems, previous scholars have not ascertained what role market hunting played in this dilemma, what combination of other factors was involved, or what the tribes attempted to do about it.

The crux of the problem in studying Southern Plains Indian ecology and bison is to determine whether the Plains tribes had established a society in ecological equilibrium, one whose population did not exceed the carrying capacity of its habitat and so maintained a healthy, functioning ecology that could be sustained over the long term. Answering that question involves an effort to come to grips with the factors affecting bison populations, the factors affecting Indian populations, and the cultural aspects of Plains Indians' utilization of bison. Each of the three aspects of the question presents puzzles difficult to resolve.

In modern, protected herds on the Plains, bison are a prolific species whose numbers increase by an average of 18 percent a year, assuming a normal sex ratio (51 males to 49 females) with breeding cows amounting to 35 percent of the total. In other words, if the Southern Plains supported 8.2 million bison in years of median rainfall, the herds would have produced about 1.4 million calves a year. To maintain an ecological equilibrium with the grasses, the Plains bison's natural mortality rate also had to approach 18 percent.

Today the several protected bison herds in the western United States have a natural mortality rate, without predation, ranging between 3 and 9 percent. The Wichita Mountains herd, the only large herd left on the Southern Plains, falls midway with a 6 percent mortality rate. Despite a search for it, no inherent naturally regulating mechanism has yet been found in bison populations; thus active culling programs are needed at all the Plains bison refuges. The starvation-induced population crashes that affect ungulates such as deer were seemingly mitigated on the wild, unfenced Plains by the bison's tendency—barring any major impediments—to shift their range great distances to better pasture.

Determining precisely how the remaining annual mortality in the wild herds was affected is not easy, because the wolf/bison relationship on the Plains has never been studied. Judging from dozens of historical documents attesting to wolf predation of bison calves, including accounts by the Indians, wolves apparently played a critical role in Plains bison population dynamics, and not just as culling agents of diseased and old animals.

Human hunters were the other source of mortality. For nine thousand years native Americans had hunted bison without exterminating them, perhaps building into their gene pool an adjustment to human predation (dwarfed size, earlier sexual maturity, and shorter gestation times, all serving to keep populations up). But there is archaeological evidence that beginning about A.D. 1450, with the advent of "mutualistic" trade between Puebloan communities recently forced by drought to relocate on the Rio Grande and a new wave of Plains hunters (probably the Athapaskan-speaking Apacheans), human pressures on the southern bison herd accelerated, evidently dramatically if the archaeological record in New Mexico is an accurate indication. That pressure would have been a function of both the size of the Indian population and the use of bison in Indian cultures. Because Plains Indians traded bison-derived goods for the produce of the horticultural villages fringing the Plains, bison would be affected by changes in human population peripheral to the Great Plains as well as on them.

One attempt to estimate maximum human population size on the Southern Plains, that of Jerold Levy, fixed the upper limit at about 10,500 people. Levy argued that water would have been a more critical resource than bison in fixing a limit for Indian populations. Levy's population figures are demonstrably too low, and he lacked familiarity with the aquifer-derived drought-resistant sources of water on the Southern Plains. But his argument that water was the more critical limiting resource introduces an important element into the Plains equation.

The cultural utilization of bison by horse Indians has been studied by Bill Brown. Adapting a sophisticated formula worked out first for caribou hunters in the Yukon, Brown has estimated Indian subsistence (caloric requirements plus the number of robes and hides required for domestic use) at about 47 animals per lodge per year. At an average of 8 people per lodge, that works out to almost 6 bison per person over a year's time. Brown's article is not only highly useful in getting us closer to a historic Plains equation than ever before; it is also borne out by at least one historic account. In 1821 the trader Jacob Fowler camped for several weeks with 700 lodges of Southern Plains tribes on the Arkansas River. Fowler was no ecologist; in fact, he could hardly spell. But he was a careful observer, and he wrote that the big camp was using up 100 bison a day. In other words, 700 lodges were using bison at a rate of about 52 per lodge per year, or 6.5 animals per person. These are important figures. Not only do they give us some idea of the mortality percentage that can be assigned to human hunters; by extension they help us fix a quadruped predation percentage as well.

Estimates of the number of Indians on the Southern Plains during historic times are not difficult to find, but they tend to vary widely, and for good reason, as will be seen when we look closely at the historical events of the first half of the nineteenth century. Although observers' population estimates for the Comanches go as high as 30,000, six of the seven population figures for the Comanches estimated between 1786 and 1854 fall into a narrow range between 19,200 and 21,600. Taken together, the number of Kiowas, Cheyennes, Arapahoes, Plains Apaches, Kiowa-Apaches, and Wichitas probably did not exceed 12,000 during that same period. Contemporaries estimated the combined number of Cheyennes and Arapahoes, for example, as 4,400 in 1838, 5,000 in 1843, and 5,200 in 1846. If the historic Southern Plains hunting population reached 30,000, then human hunters would have accounted for only 195,000 bison per year if we use the estimate of 6.5 animals per person.

But another factor must have played a significant role. While quadruped predators concentrated on calves and injured or feeble animals, human hunters had different criteria. Historical documents attest to the horse Indians' preference for and success in killing two- to five-year-old bison cows, which were preferred for their meat and for their thinner, more easily processed hides and the luxurious robes made from their pelts. Studies done on other large American ungulates indicate that removal of breeding females at a level that exceeds 7 percent of the total herd will initiate population decline. With 8.2 million bison on the Southern Plains, the critical upper figure for cow selectivity would have been about 574,000 animals. Reduce the total bison number to 6 million and the yearly calf crop to 1.08 million, probably more realistic median figures for the first half of the nineteenth century, and the critical mortality for breeding cows would still have been 420,000 animals. As mentioned, a horse-mounted, bison-hunting population of 30,000 would have harvested bison at a yearly rate of less than 200,000. Hence I would argue that, theoretically, on the Southern Plains the huge biomass of bison left from the Pleistocene extinctions would have supported the subsistence needs of more than 60,000 Plains hunters.

All of this raises some serious questions when we look at the historical evidence from the first half of the nineteenth century. By the end of that period, despite an effort at population growth by many Plains tribes, the population estimates for most of the Southern Plains tribes were down. And many of the bands seemed to be starving. Thomas Fitzpatrick, the Cheyennes' and Arapahoes' first agent, reported in 1853 that the tribes in his district spent half the year in a state of starvation. The Comanches were reported to be eating their horses in great numbers by 1850, and their raids into Mexico increased all through the 1840s, as if a resource depletion in their home range was driving them to compensate with stolen stock. In the painted robe calendars of the Kiowas, the notation for "few or no bison" appears for four years in a row between 1849 and 1852. Bison were becoming less reliable, and the evolution toward an economy based on raiding and true horse pastoralism was well under way. Clearly, by 1850 something had altered the situation on the Southern Plains.

The "something" was, in fact, a whole host of ecological alterations that historians with a wide range of data at their disposal are only now, more than a century later, beginning to understand.

As early as 1850 the bison herds had been weakened in a number of ways. The effect of the horse on Indian culture has been much studied, but in working out a Southern Plains ecological model, it is important to note that horses also had a direct effect on bison numbers. By the second quarter of the nineteenth century the domesticated horse herds of the Southern Plains tribes must have ranged between .25 and .50 million animals (at an average of 10 to 15 horses per person). In addition, an estimated 2 million wild mustangs overspread the country between south Texas and the Arkansas River. That many animals of a species with an 80 percent dietary overlap with bovines and, perhaps more critically, with similar water requirements, must have had an adverse impact on bison carrying capacity, especially since Indian horse herds concentrated the tribes in the moist canyons and river valleys that bison also used for watering. Judging from the 1910 agricultural census, 2 million or more horses would have reduced the median grassland carrying capacity for the southern bison herd to under 6 million animals.

Another factor that may have started to diminish overall bison numbers was the effect of exotic bovine diseases. Anthrax, introduced into the herds from Louisiana around 1800, tuberculosis, and brucellosis, the latter brought to the Plains by feral and stolen Texas cattle and by stock on the overland trails, probably had considerable impact on the bison herds. All the bison that were saved in the late nineteenth century had high rates of infection with these diseases. Brucellosis plays havoc with reproduction in domestic cattle, causing cows to abort; it may have done so in wild bison, and butchering them probably infected Indian women with the disease.

Earlier I mentioned modern natural mortality figures for bison of 3 percent to 9 percent of herd totals. On the wilderness Plains, fires, floods, drownings, droughts, and strange die-offs may have upped this percentage considerably. But if we hold to the higher figure, then mortality might have taken an average of 50 percent of the annual bison increase of 18 percent. Thirty thousand subsistence hunters would have killed off only 18 percent of the bison's yearly increase (if the herd was 6 million). The long-wondered-at wolf predation was perhaps the most important of all the factors regulating bison populations, with a predation percentage of around 32% of the annual bison increase. (Interestingly, this dovetails

closely with the Pawnee estimate that wolves got 3 to 4 of every 10 calves born.) Wolves and other canids are able to adjust their litter sizes to factors like mortality and resource abundance. Thus, mountain men and traders who poisoned wolves for their pelts may not have significantly reduced wolf populations. They may have inadvertently killed thousands of bison, however, for poisoned wolves drooled and vomited strychnine over the grass in their convulsions. Many Indians lost horses that ate such poisoned grass.

The climate cycle, strongly correlated with bison populations in the archaeological data for earlier periods, must have interacted with these other factors to produce a decline in bison numbers between 1840 and 1850. Except for a dry period in the mid- to late 1820s, the first four decades of the nineteenth century had been a time of above-normal rainfall on the Southern Plains. With the carrying capacity for bison and horses high, the country south of the Arkansas sucked tribes to it as into a vortex. But beginning in 1846, rainfall plunged as much as 30 percent below the median for nine of the next ten years. On the Central Plains, six years of that decade were dry. The growth of human populations and settlements in Texas, New Mexico, and the Indian Territory blocked the bison herds from migrating to their traditional drought refugia on the periphery of their range. Thus, a normal climate swing combined with unprecedented external pressures to produce an effect unusual in bison history—a core population, significantly reduced by competition with horses and by drought, that was quite susceptible to human hunting pressure.

Finally, alterations in the historical circumstances of the Southern Plains tribes from 1825 to 1850 had serious repercussions for Plains ecology. Some of those circumstances were indirect and beyond the tribes' ability to influence. Traders along the Santa Fe Trail shot into, chased, and disturbed the southern herds. New Mexican *Ciboleros* (bison hunters) continued to take fifteen to twenty-five thousand bison a year from the Llano Estacado. And the United States government's removal of almost fifty thousand eastern Indians into Oklahoma increased the pressure on the bison herds to a level impossible to estimate. The Southern Plains tribes evidently considered it a threat and refused to abide by the Treaty of Fort Holmes (1835) when they discovered it gave the eastern tribes hunting rights on the prairies.

Insofar as the Southern Plains tribes had an environmental policy, then, it was to protect the bison herds from being hunted by outsiders. The Comanches could not afford to emulate their Shoshonean ancestors and limit their own population. Beset by enemies and disease, they had to try to keep their numbers high, even as their resource base diminished. For the historic Plains tribes, warfare and stock raids addressed ecological needs created by diminishing resources as well as the cultural impulse to enhance men's status, and they must have seemed far more logical solutions than consciously reducing their own populations as the bison herds became less reliable.

For those very reasons, after more than a decade of warfare among the buffalo tribes, in 1840 the Comanches and Kiowas adopted a strategy of seeking peace and an alliance with the Cheyennes, Arapahoes, and Kiowa-Apaches. From the Comanches' point of view, it brought them allies against Texans and eastern

Indians who were trespassing on the Plains. The Cheyennes and Arapahoes got what they most wanted: the chance to hunt the grass- and bison-rich Southern Plains, horses and mules for trading, and access to the Spanish settlements via Comanche lands. But the peace meant something else in ecological terms. Now all the tribes could freely exploit the Arkansas Valley bison herds. This new exploitation of a large, prime bison habitat that had been a boundary zone skirted by Indian hunters may have been critical. In the Kiowa Calendar the notation for "many bison" appears in 1841, the year following the peace. The notation appears only once more during the next thirty-five years.

One other advantage the Comanches and Kiowas derived from the peace of 1840 was freedom to trade at Bent's Fort. Although the data to prove it are fragmentary, this conversion of the largest body of Indians on the Southern Plains from subsistence/ecosystem hunters to a people intertwined in the European market system probably added critical stress to a bison herd already being eaten away. How serious the market incentive could be is indicated by John Whitfield, agent at William Bent's second Arkansas River fort in 1855, who wrote that 3,150 Cheyennes were killing 40,000 bison a year. That is about twice the number the Cheyennes would have harvested through subsistence hunting alone. (It also means that on the average every Cheyenne warrior was killing 44 bison a year and every Cheyenne woman was processing robes at the rate of almost one a week.) With the core bison population seriously affected by the drought of the late 1840s, the additional, growing robe trade of the Comanches probably brought the Southern Plains tribes to a critical level in their utilization of bison. Drought, Indian market hunting, and cow selectivity must stand as the critical elements—albeit augmented by minor factors such as white disturbance, new bovine diseases, and increasing grazing competition from horses—that brought on the bison crisis of the midcentury Southern Plains. That explanation may also illuminate the experience of the Canadian Plains, where bison disappeared without the advent of white hide hunting.

Perhaps that would have happened on the American Plains if the tribes had held or continued to augment their populations. But the Comanches and other tribes fought a losing battle against their own attrition. While new institutions such as male polygamy and adoption of captured children worked to build up the Comanches' numbers, the disease epidemics of the nineteenth century repeatedly decimated them. In the 1820s, the Comanches were rebuilding their population after the smallpox epidemic of 1816 had carried away a fourth of them. But smallpox ran like a brush fire through the Plains villages again in 1837–1838, wiping whole peoples off the continent. And the forty-niners brought cholera, which so devastated the Arkansas Valley Indians that William Bent burned his fort and temporarily left the trade that year. John C. Ewers, in fact, has estimated that the nineteenth-century Comanches lost 75 percent of their population to disease.

Did the Southern Plains Indians successfully work out a dynamic, ecological equilibrium with the bison herds? I would argue that the answer remains ultimately elusive because the relationship was never allowed to play itself out. The trends, however, suggest that a satisfactory solution was improbable. One factor that worked against the horse tribes was their short tenure. It may be that two

centuries provided too brief a time for them to create a workable system around horses, the swelling demand for bison robes generated by the Euro-American market, and the expansion of their own populations to hold their territories. Some of those forces, such as the tribes' need to expand their numbers and the advantages of participating in the robe trade, worked against their need to conserve the bison herds. Too, many of the forces that shaped their world were beyond the power of the Plains tribes to influence. And it is very clear that the ecology of the Southern Plains had become so complicated by the mid-nineteenth century that neither the Indians nor the Euro-Americans of those years could have grasped how it all worked.

Finally and ironically, it seems that the Indian religions, so effective at calling forth awe and reverence for the natural world, may have inhibited the Plains Indians' understanding of bison ecology and their role in it. True, native leaders such as Yellow Wolf, the Cheyenne whom James W. Abert interviewed and sketched at Bent's Fort in 1845–1846, surmised the implications of market hunting. As he watched the bison disappearing from the Arkansas Valley, Yellow Wolf asked the whites to teach the Cheyenne hunters how to farm, never realizing that he was reprising a Plains Indian/Euro-American conversation that had taken place sixty years earlier in that same country. But Yellow Wolf was marching to his own drummer, for it remained a widespread tenet of faith among most Plains Indians through the 1880s that bison were supernatural in origin. A firsthand observer and close student of the nineteenth-century Plains reported,

> Every Plains Indian firmly believed that the buffalo were produced in countless numbers in a country under the ground, that every spring the surplus swarmed like bees from a hive, out of great cave-like openings to this country, which were situated somewhere in the great 'Llano Estacado' or Staked Plain of Texas.

This religious conception of the infinity of nature's abundance was poetic. On one level it was also empirical: Bison overwintered in large numbers in the protected canyons scored into the eastern escarpment of the Llano Estacado, and Indians had no doubt many times witnessed the herds emerging to overspread the high Plains in springtime. But such a conception did not aid the tribes in their efforts to work out an ecological balance amid the complexities of the nineteenth-century Plains.

In a real sense, then, the more familiar events of the 1870s only delivered the *coup de grâce* to the free Indian life on the Great Plains. The slaughterhouse effects of European diseases and wars with the encroaching whites caused Indian numbers to dwindle after 1850 (no more than fourteen hundred Comanches were enrolled to receive federal benefits at Fort Sill, in present-day Oklahoma, in the 1880s). This combined with bison resiliency to preserve a good core of animals until the arrival of the white hide-hunters, who nonetheless can be documented as taking only about 3.5 million animals from the Southern Plains.

But the great days of the Plains Indians, the primal poetry of humans and horses, bison and grass, sunlight and blue skies, and the sensuous satisfactions of a hunting life on the sweeping grasslands defined a meteoric time indeed. And the meteor was already fading in the sky a quarter century before the Big Fifties began to boom.

FURTHER READING

Gary C. Anderson, "Early Dakota Migration and Intertribal War: A Revision," *Western Historical Quarterly* 11 (1980), 17–36

———, *Kinsmen of Another Kind: Dakota-White Relations in the Upper Mississippi Valley, 1500–1862* (1984)

Donald J. Berthrong, *The Southern Cheyennes* (1963)

R. David Edmunds, "Indians as Pioneers: Potawatomies on the Frontier," *Chronicles of Oklahoma* 65 (1987–1988), 340–353

John C. Ewers, "Intertribal Warfare as the Precursor of Indian-White Warfare on the Northern Great Plains," *Western Historical Quarterly* 6 (1975), 397–410

———, *Teton Dakota History and Ethnology* (1938)

George Bird Grinnell, *The Cheyenne Indians: Their History and Ways of Life,* 2 vols. (1924)

J. Evetts Haley, "The Comanchero Trade," *Southwestern Historical Quarterly* 38 (1935), 157–177

Harold Hickerson, *The Chippewa and Their Neighbors: A Study in Ethnohistory* (1970)

———, *Mdewakaton Band of Sioux Indians,* Vol. 1 of *Sioux Indians* (1974)

Preston Holder, *The Hoe and the Horse on the Plains: A Study of Cultural Development Among North American Indians* (1970)

George E. Hyde, *Indians of the High Plains* (1961)

———, *Red Cloud's Folk: A History of the Oglala Sioux Indians* (1957)

Mark A. Judy, "Powder Keg on the Upper Missouri: Sources of Blackfeet Hostility, 1730–1810," *American Indian Quarterly* 11 (1987), 127–144

Charles L. Kenner, *A History of New Mexican–Plains Indian Relations* (1969)

Robert H. Lowie, *Indians of the Plains* (1954)

Roy W. Meyer, *History of the Santee Sioux: United States Indian Policy on Trial* (1967)

———, *The Village Indians of the Upper Missouri: The Mandans, Hidatsas, and Arikaras* (1977)

Roger L. Nichols, "Backdrop for Disaster: Causes of the Arikara War of 1823," *South Dakota History* 14 (1984), 93–113

Wilbur S. Nye, *Bad Medicine and Good: Tales of the Kiowas* (1959)

Francis Paul Prucha, "American Indian Policy in the 1840s: Visions of Reform," in John C. Clark, ed., *The Frontier Challenge: Responses to the Trans-Mississippi West* (1971)

———, "Indian Removal and the Great American Desert," *Indiana Magazine of History* 59 (1963), 309–322

Rupert Norval Richardson, *The Comanche Barrier to South Plains Settlement* (1933)

Carl Coke Rister, *Border Captives: The Traffic in Prisoners by Southern Plains Indians, 1835–1875* (1940)

———, *Comanche Bondage* (1955)

Frank R. Secoy, *Changing Military Patterns on the Great Plains: 17th Century Through Early 19th Century* (1953)

John E. Sunder, *The Fur Trade on the Upper Missouri, 1840–1865* (1965)

Robert A. Trennert, Jr., *Alternative to Extinction: Federal Indian Policy and the Beginnings of the Reservation System, 1846–1851* (1975)

William E. Unrau, *The Kansa Indians: A History of the Wind People, 1673–1873* (1971)

Ernest Wallace and E. Adamson Hoebel, *The Comanches, Lords of the South Plains* (1952)