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Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 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.¹

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 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?²

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

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¹ See Jacobo Loyola y Ugarte to Juan Bautista de Anza, Oct. 5, 1786, roll 10, series II, Spanish Archives of New Mexico, microfilm (New Mexico State Archives, Santa Fe).

² *Ibid.* One line reads: "use all your sagacity and efficiency, making evident to the [Comanche] Captains . . . that the animals they hunt with such effort at sustenance are not at base inexhaustible." See also Alfred B. Thomas, ed., *Forgotten Frontiers: A Study of the Spanish Indian Policy of Don Juan Bautista de Anza, Governor of New Mexico, 1777-1787* (Norman, 1932), 69-72, 82.

Euro-Americans.³ Thus far, however, modern scholarship has not reevaluated the most visible historic interaction, the set piece if you will, of native American environmental history.⁴ 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

³ See Alfred W. Crosby, Jr., *The Columbian Exchange: Biological Consequences of 1492* (Westport, 1972); Alfred W. Crosby, Jr., *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (New York, 1986); Henry Dobyns, *Native American Historical Demography* (Bloomington, 1976); Henry Dobyns, *Their Number Become Thinned: Native American Population Dynamics in Eastern North America* (Knoxville, 1983); Calvin Martin, *Keepers of the Game: Indian-Animal Relations and the Fur Trade* (Berkeley, 1979); Richard White, *Roots of Dependency* (Lincoln, 1983); William Cronon, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (New York, 1983); Paul Martin and Henry Wright, Jr., eds., *Pleistocene Extinctions: The Search for a Cause* (New Haven, 1967); and Paul Martin and Richard Klein, eds., *Quaternary Extinctions* (Tucson, 1985).

⁴ See Richard White, "American Indians and the Environment," *Environmental Review*, 9 (Summer 1985), 101-3; Richard White, "Native Americans and the Environment," in *Scholars and the Indian Experience: Critical Reviews of Recent Writings in the Social Sciences*, ed. W. R. Swagerty (Bloomington, 1984), 179-204; Christopher T. Vecsey and Robert W. Venables, eds., *American Indian Environments: Ecological Issues in Native American History* (Syracuse, 1980); Richard White and William Cronon, "Ecological Change and Indian-White Relations," in *Handbook of North American Indians*, ed. William C. Sturtevant (20 vols., Washington, 1978-1989), IV, 417-29; and Donald J. Hughes, *American Indian Ecology* (El Paso, 1983).

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.⁵ 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.⁶ 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

⁵ See White, “American Indians and the Environment,” 101; and White and Cronon, “Ecological Change and Indian-White Relations.”

⁶ Several earlier scholars have addressed this question. For an early argument that the horse Indians overhunted bison, see William T. Hornaday, “The Extirpation of the American Bison, with a Sketch of its Discovery and Life History,” *Smithsonian Report*, 1887, pp. 480–90, 506. For statements of this position that offer nothing beyond anecdotal evidence, see James Malin, *History and Ecology*, ed. Robert Swierenga (Lincoln, 1984), 9, 31–54; George Hyde, *Spotted Tail’s Folk* (Norman, 1961), 24; and Preston Holder, *The Hoe and the Horse on the Plains* (Lincoln, 1970), 111, 118. For the contrary view, see Frank Roe, *The North American Buffalo: A Critical Study of the Species in its Wild State* (Toronto, 1951), 500–505, 655–70; and Frank Roe, *The Indian and the Horse* (Norman, 1955), 190–91. The breadth and authority of Roe’s books have given him priority in the field.

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.⁷

These early Shoshonean hunters may not have spent more than three or four generations among the thronging Plains bison herds, for by the late 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 Northern Plains, and a wedge that sent ripples of tribal displacement across the Plains.⁸

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.⁹

⁷ Since it utilizes long-ignored Spanish documents, on the Comanche's migration I follow Thomas Kavanagh, "Political Power and Political Organization: Comanche Politics, 1786-1875" (Ph.D. diss., University of New Mexico, 1986), rather than Ernest Wallace and E. Adamson Hoebel, *The Comanches: Lords of the South Plains* (Norman, 1951). Dimitri Boris Shimkin, *Wind River Shoshone Ethnography* (Berkeley, 1947); James A. Goss, "Basin-Plateau Shoshonean Ecological Model," in *Great Basin Cultural Ecology: A Symposium*, ed. Don D. Fowler (Reno, 1972), 123-27.

⁸ Richard White, "The Winning of the West: The Expansion of the Western Sioux in the Eighteenth and Nineteenth Centuries," *Journal of American History*, 65 (Sept. 1978), 319-43.

⁹ Kiowa origin myths set on the Northern Plains are at variance with the linguistic evidence, which ties them to the Tanoan speakers of the Rio Grande pueblos. Scholars are coming to believe that there is a connection between the mysterious Jumano peoples of the seventeenth- and eighteenth-century New Mexico documents and the later Kiowas. See Nancy Hickerson, "The Jumano and Trade in the Arid Southwest, 1580-1700," 1989 (in Dan Flores's possession). I am indebted to Ms. Hickerson for allowing me to examine her work. William Brandon, *Indians* (Boston, 1987), 340.

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.¹⁰

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.¹¹ 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 in-

¹⁰ Ernest Wallace, "The Habitat and Range of the Kiowa, Comanche and Apache Indians Before 1867," prepared for the United States Department of Justice for Case No. 257 before the Indian Claims Commission, 1959 (Southwest Collection, Texas Tech University, Lubbock). See Thomas Kavanagh, "The Comanche: Paradigmatic Anomaly or Ethnographic Fiction," *Haliksa'i*, 4 (1985), 109–28; Melburn D. Thurman, "A New Interpretation of Comanche Social Organization," *Current Anthropology*, 23 (Oct. 1982), 578–79; Daniel J. Gelo, "On a New Interpretation of Comanche Social Organization," *ibid.*, 28 (Aug.–Oct. 1987), 551–52; Melburn D. Thurman, "Reply," *ibid.*, 552–55. For the earlier position that the Comanches are atypical on the Plains, see Symmes Oliver, *Ecology and Cultural Continuity as Contributing Factors in the Social Organization of the Plains Indians* (Berkeley, 1972), 69–80.

¹¹ Jerry McDonald, *North American Bison: Their Classification and Evolution* (Berkeley, 1981), 250–63.

tervals, in a long-term dendrochronological pattern that seems to show a drying cycle (shorter drought-free intervals) beginning in the 1850s.¹²

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.¹³

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.¹⁴ 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.¹⁵ But if the Great Plains bovine carrying capacity of 1910 expresses a median reality, then

¹² Tom Dillehay, "Late Quarternary Bison Population Changes on the Southern Plains," *Plains Anthropologist*, 19 (Aug. 1974), 180–96; Darrell Creel et al., "A Faunal Record from West-Central Texas and Its Bearing on Late Holocene Bison Population Changes in the Southern Plains," *ibid.*, 35 (April 1990), 55–69. For Great Plains dendrochronology, see Harry Weakly, "A Tree-Ring Record of Precipitation in Western Nebraska," *Journal of Forestry*, 41 (Nov. 1943), 816–19; and Edmund Schulman, *Dendroclimatic Data from Arid America* (Tucson, 1956), 86–88. For use of meteorological data to argue that climate variability was exponentially greater on the Southern Plains than farther north, see Douglas Bamforth, *Ecology and Human Organization on the Great Plains* (New York, 1988), 74.

¹³ Weakly, "Tree-Ring Record of Precipitation in Western Nebraska," 819.

¹⁴ U.S. Department of Commerce, Bureau of the Census, *Thirteenth Census of the United States, Taken in the Year 1910*, vols. VI and VII: *Agriculture, 1909 and 1910* (Washington, 1913). My method has been to compile 1910 cattle, horse, and mule figures for the then-existing Plains counties of Texas (119), western Oklahoma (45), New Mexico (10), counties below the Arkansas River in Colorado (8), and counties in southwestern Kansas (19). The carrying capacity for a biome such as the Great Plains ought to be measured by the use of the county figures. The principal problem with this technique in the past has been overgeneralization of stock numbers through reliance on state totals. It was first used by Ernest Thompson Seton, *Life Histories of Northern Animals* (2 vols., New York, 1909), I, 259–63; and more recently by Bill Brown, "Comancheria Demography, 1805–1830," *Panhandle-Plains Historical Review*, 59 (1986), 8–12. Range management commonly assigns cows a grazing quotient of 1.0, bulls a quotient of 1.30, and horses and mules 1.25.

¹⁵ Joseph Chapman and George Feldhamer, eds., *Wild Mammals of North America: Biology, Management, and Economics* (Baltimore, 1982), 978, 986, 1001–2. Modern bison ranchers claim that bison achieve greater land-use efficiency and larger herd size on native grass compared to cattle. The editors of the above work call for more research into this question. See also Charles Rehr, "Buffalo Population and Other Deterministic Factors in a Model of Adaptive Process on the Shortgrass Plains," *Plains Anthropologist*, 23 (Nov. 1978), 25–27.

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.¹⁶

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.¹⁷ 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.¹⁸ 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.¹⁹

¹⁶ For the use of a different formula (mean potential bovine carrying capacity per acre) to arrive at similar totals see Tom McHugh, *The Time of the Buffalo* (New York, 1972), 16–17. For the reasonably convincing argument that because of climate variability and less nutritious grasses, population densities of Great Plains bison were lowest on the Southern Plains, see Bamforth, *Ecology and Human Organization on the Great Plains*, 74, 78.

¹⁷ The figure for loss of plant lore is based on a comparison of remembered ethnobotanies for the Shoshones (172 species) and the Comanches (67 species). See Brian Spykerman, "Shoshoni Conceptualizations of Plant Relationships" (M.S. thesis, Utah State University, 1977); and Gustav Carlson and Volney Jones, "Some Notes on the Uses of Plants by the Comanche Indians," *Papers of the Michigan Academy of Science, Arts, and Letters*, 25 (1939), 517–42. On women's loss of status, see Holder, *Hoe and the Horse on the Plains*.

¹⁸ Wallace and Hoebel, *Comanches*, 142. On the loss of Shoshone birth control mechanisms among Comanche women, see Abram Kardiner, "Analysis of Comanche Culture," in *The Psychological Frontiers of Society*, ed. Abram Kardiner et al. (New York, 1945). For a report of 500 adopted captives in a decade, see Jean Louis Berlandier, *The Indians of Texas in 1830*, ed. John C. Ewers (Washington, 1969), 119. Estimates on the Euro-American constituency of nineteenth-century Comanche bands as approaching 75% are probably too high, but 30% may not be. On Comanche adoption and captives trade, see Carl C. Rister, *Border Captives: The Traffic in Prisoners by Southern Plains Indians, 1835–1875* (Norman, 1940); and Russell Magnaghi, "The Indian Slave Trader: The Comanche, a Case Study" (Ph.D. diss., St. Louis University, 1970). Indian Agent Thomas Fitzpatrick was adamant that Comanche raids were for children, "to keep up the numbers of the tribe." See Kardiner, "Analysis of Comanche Culture," 89. On hunter-gatherer carrying capacity, see Marvin Harris and Eric Ross, *Death, Sex, and Fertility: Population Regulation in Preindustrial and Developing Societies* (New York, 1987), 23–26; and Ezra Zubrow, *Prehistoric Carrying Capacity: A Model* (Menlo Park, 1975).

¹⁹ David Kaplan, "The Law of Cultural Dominance," in *Evolution and Culture*, ed. Marshall Sahlins and Elman

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.²⁰

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, as did the prairie 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.²¹

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 south-westward 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

Service (Ann Arbor, 1960), 75–82. On Apache vulnerability, see George E. Hyde, *Indians of the High Plains: From the Prehistoric Period to the Coming of Europeans* (Norman, 1975), 65, 70, 91. Other explanations include the Spanish refusal to trade guns to the Apaches and Comanche superiority at horse care. For less monocausal interpretations, see Frederick W. Rathjen, *The Texas Panhandle Frontier* (Austin, 1973), 47–48.

²⁰ For references to Comanche names containing the word *wolf* (rendered by Euro-Americans as *isa*, *ysa*, *esa*, or sometimes with an *sh* second syllable), see George Catlin, *Letters and Notes on the Manners, Customs, and Conditions of the North American Indians* (2 vols., New York, 1973), II, 67–69; Noel Loomis and Abraham Nasatir, eds., *Pedro Vial and the Roads to Santa Fe* (Norman, 1967), 488n22a; and Thomas, *Forgotten Frontiers*, 325–27.

²¹ On Comanche trade with Anglo-Americans, see Dan Flores, ed., *Journal of an Indian Trader: Anthony Glass and the Texas Trading Frontier, 1790–1810* (College Station, 1985), esp. 3–33; and Thomas James, *Three Years among the Indians and Mexicans*, ed. Walter Douglas (St. Louis, 1916), 191–235. For the argument that the Comanches were among the earliest Plains traders, and that Comanche leadership evolved in a trade/market situation, see Kavanagh, "Political Power and Political Organization." See Charles Kenner, *A History of New Mexican-Plains Indian Relations* (Norman, 1969); and William Swagerty, "Indian Trade in the Trans-Mississippi West to 1870," in *Handbook of North American Indians*, ed. Sturtevant, IV, 351–74.



Kiowa Buffalo Hunter, by unknown Indian artist after 1875, on reservation ledger paper.

By the nineteenth century, many Plains Indians had come to define themselves as bison predators, a dependency that was beginning to fail them by 1850.

Courtesy Morning Star Gallery, Santa Fe, New Mexico.

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.²²

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.²³

²² See Hickerson, "Jumano and Trade in the Arid Southwest." On Kiowa origins, see also Maurice Boyd, *Kiowa Voices: Ceremonial Dance, Ritual, and Songs* (2 vols., Fort Worth, 1981); and John Wunder, *The Kiowas* (New York, 1989).

²³ Elizabeth A. H. John, "An Earlier Chapter of Kiowa History," *New Mexico Historical Review*, 60 (no. 4, 1985),



Picketing Horses, painting by Alfred Jacob Miller. Here two Euro-American traders stake horses they have chosen from the Indians' herd behind them. By reducing the carrying capacity for bison on the Great Plains and stimulating Indian/Euro-American trade, horses were a critical element in nineteenth-century Plains ecology.

Courtesy Walters Art Gallery, Baltimore.

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 Sheyenne 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.²⁴ But by the second decade of the nineteenth century the Teton Sioux wedge had made nomads and hunters of the Arapahoes and Cheyennes.

379-97. On traders' contacts with the Kiowas, see, particularly, Maxine Benson, ed., *From Pittsburgh to the Rocky Mountains: Major Stephen Long's Expedition, 1819-1820* (Golden, 1988), 327-36.

²⁴ Holder, *Hoe and the Horse on the Plains*. See also Bea Medicine and Pat Albers, *The Hidden Half: Studies of Plains Indian Women* (Lanham, 1983); and Katherine Weist, "Plains Indian Women: An Assessment," in *Anthropology on the Great Plains*, ed. Raymond Wood and Margot Liberty (Lincoln, 1980), 255-71.

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.²⁵

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.²⁶

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

²⁵ Joseph Jablow, *The Cheyenne in Plains Indian Trade Relations, 1795-1840* (Seattle, 1950); Donald Berthrong, *The Southern Cheyennes* (Norman, 1963), 4-21; Loomis and Nasatir, eds., *Pedro Vial and the Roads to Santa Fe*, 256-58.

²⁶ Alan Osburn, "Ecological Aspects of Equestrian Adaptations in Aboriginal North America," *American Anthropologist*, 85 (Sept. 1983), 563-91; Berthrong, *Southern Cheyennes*, 25-26; Jablow, *Cheyenne in Plains Indian Trade Relations*, 67; David Lavender, *Bent's Fort* (Lincoln, 1954), 141-54; George Phillips, *Chiefs and Challengers: Indian Resistance and Cooperation in Southern California* (Berkeley, 1975), 42-43; Eleanor Lawrence, "The Old Spanish Trail from Santa Fe to California" (M.A. thesis, University of California, Berkeley, 1930).

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.²⁷

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.²⁸

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.²⁹ 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.

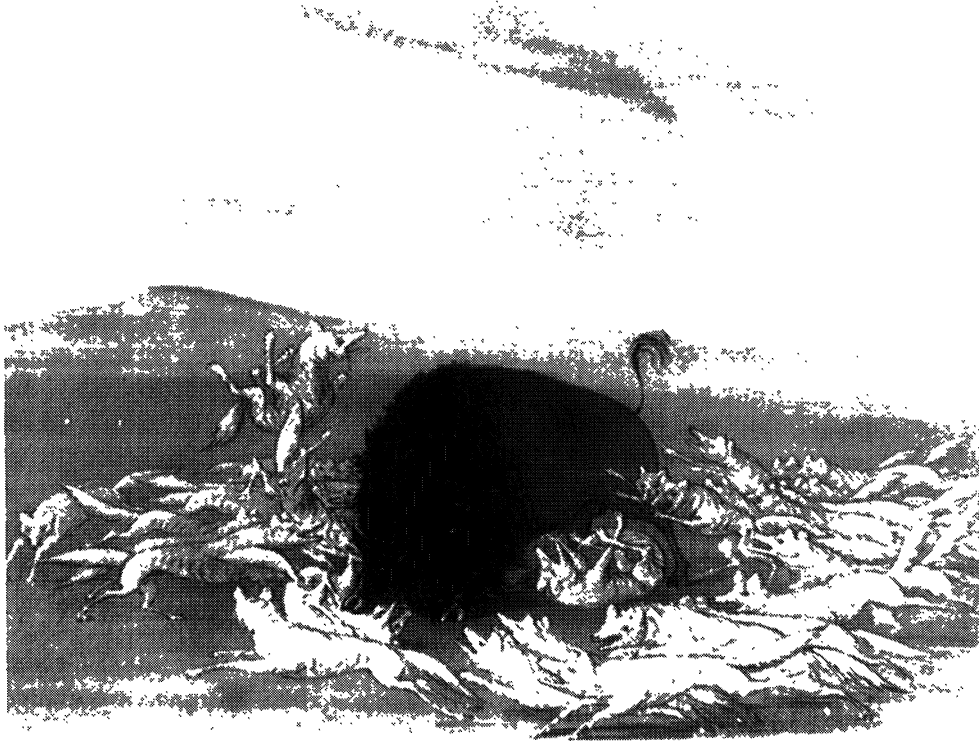
In modern, protected herds on the Plains, bison are a prolific species whose numbers increase by an average of 18 percent a year, assuming a normal sex ratio (51 males to 49 females) with breeding cows amounting to 35 percent of the total.³⁰ In other words, if the Southern Plains supported 8.2 million bison in years of median rainfall, the herds would have produced about 1.4 million calves a year. To

²⁷ On the intertribal buffer zones, see Berthrong, *Southern Cheyennes*, 76, 93. On their function in preserving wildlife in other ecosystems, see Harold Hickerson, "The Virginia Deer and Intertribal Buffer Zones in the Upper Mississippi Valley," *Man, Culture, and Animals*, ed. Anthony Leeds and Andrew Vayda (Washington, 1965), 43-66.

²⁸ Raymond Dasmann, "Future Primitive," *CoEvolution Quarterly*, 11 (1976), 26-31; David Wishart, *The Fur Trade of the American West, 1807-1840* (Lincoln, 1979); Arthur Ray, *The Fur Trade and the Indian* (Toronto, 1974); White, *Roots of Dependency*, 147-211.

²⁹ Zubrow, *Prehistoric Carrying Capacity*, 8-9.

³⁰ Chapman and Feldhamer, eds., *Wild Mammals of North America*, 980-83; Arthur Halloran, "Bison (Bovidae) Productivity on the Wichita Mountains Wildlife Refuge, Oklahoma," *Southwestern Naturalist*, 13 (May 1968), 23-26; Alisa Shull and Alan Tipton, "Effective Population Size of Bison on the Wichita Mountains Wildlife Refuge," *Conservation Biology*, 1 (May 1987), 35-41.



White Wolves Attacking Buffalo, watercolor by George Catlin, 1832. By preying on injured and older bison, and especially bison calves, wolves played a key role in holding bison population in equilibrium with the grasslands.
Courtesy Smithsonian Institution, Anthropological Archives.

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.³¹

³¹ Data on the modern bison herds on the Great Plains are from the refuge managers and superintendents of the Wichita Mountains Wildlife Refuge, Theodore Roosevelt National Memorial Park, and Wind Cave National Park. The National Bison Refuge in Montana did not respond to my inquiries. Robert Karges to Dan Flores, March 18, 1988 (in Flores's possession); Robert Powell to Flores, Feb. 10, 1988, *ibid.*; Ernest Ortega to Flores, Feb. 11,

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.³²

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.³³

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.³⁴

1988, *ibid.* See Graeme Caughley, "Eruption of Ungulate Populations, with Emphasis on Himalayan Thar in New Zealand," *Ecology*, 51 (Winter 1970), 53-72. This study has been widely cited in wildlife ecology as evidence that starvation rather than predation is often the key to regulating natural population eruptions. The only documentary evidence I have seen for starvation of bison on the Southern Plains is Charles Goodnight's account of seeing "millions" of starved bison along a front 25 by 100 miles between the Concho and Brazos rivers in 1867, after bison migration patterns had been disrupted by settlements. J. Evetts Haley, *Charles Goodnight, Cowman and Plainsman* (Norman, 1949), 161.

³² The 19th-century documentary evidence assigns wolves roles as scavengers of bison killed by other agents; as cullers of weak, sick, and old animals; and as predators of bison calves. The last, I believe, best expresses the regulatory effect of wolves on Plains bison population dynamics. See Gary E. Moulton, ed., *The Journals of the Lewis and Clark Expedition* (5 vols., Lincoln, 1987), IV, 62-63; Donald Jackson and Mary Lee Spence, eds., *The Expeditions of John Charles Fremont* (5 vols., Urbana, 1970-1984), I, 190-91; Henry Boller, *Among the Indians: Four Years on the Upper Missouri, 1858-1862*, ed. Milo Milton Quaife (Lincoln, 1972), 270-71; Maria Audubon and Elliott Coues, eds., *Audubon and His Journals* (2 vols., New York, 1986), I, 49; and W. Eugene Hollon, ed., *William Bollaert's Texas* (Norman, 1989), 255. For other descriptions, see Stanley P. Young and Edward A. Goldman, *The Wolves of North America* (2 vols., New York, 1944), I, 50, 218, 224-31.

³³ Katherine Spielman, "Late Prehistoric Exchange between the Southwest and Southern Plains," *Plains Anthropologist*, 28 (Nov. 1983), 257-79. For the argument that essential plant resources from this trade ended a nutrition "bottleneck" and therefore allowed the buildup of much larger human populations on the Southern Plains, see Bamforth, *Ecology and Human Organization on the Great Plains*, 8.

³⁴ Jerold Levy, "Ecology of the South Plains," in *Symposium: Patterns of Land Use and Other Papers*, ed. Viola Garfield (Seattle, 1961), 18-25.

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.³⁵

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 21,600.³⁶ 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 1846.³⁷ 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

³⁵ Brown, "Comancheria Demography," 10–11; H. Paul Thompson, "A Technique Using Anthropological and Biological Data," *Current Anthropology*, 7 (Oct. 1966), 417–24; Jacob Fowler, *The Journal of Jacob Fowler: Narrating an Adventure from Arkansas through the Indian Territory, Oklahoma, Kansas, Colorado, and New Mexico, to the Sources of the Rio Grande del Norte*, ed. Elliott Coues (New York, 1898), 61, 63.

³⁶ Wallace and Hoebel, *Comanches*, 31–32. The anthropological literature tends to set Comanche population much more conservatively, often at no more than 7,000. See, for example, Bamforth, *Ecology and Human Organization on the Great Plains*, 104–14. Such low figures ignore eyewitness accounts of localized Comanche aggregations of several thousand. I have a historian's bias in favor of documentary evidence for estimating human populations; Plains observers computed village sizes relatively easily by counting the number of tents.

³⁷ Berthrong, *Southern Cheyennes*, 78, 92, 107. The Kiowas and Kiowa-Apaches seem to have averaged about 2,500 to 3,000 from 1825 to 1850, and the Prairie Caddoans perhaps 2,000, shrinking to 1,000 by midcentury. *Report, Commissioner of Indian Affairs, 1842*, cited in Josiah Gregg, *Commerce of the Prairies*, ed. Max Moorhead (Norman, 1964), 431–32n3.

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.³⁸

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.³⁹ 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 1852.⁴⁰ 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

³⁸ Because of the tough meat and the thick hides that made soft tanning difficult, Indians (and whites hunting for meat) rarely killed bison bulls. See Roe, *North American Buffalo*, 650–70; and Larry Barsness, *Heads, Hides, and Horns: The Compleat Buffalo Book* (Fort Worth, 1974), 69–72, 96–98. Dean E. Medin and Allen E. Anderson, *Modeling the Dynamics of a Colorado Mule Deer Population* (Fort Collins, 1979). Whether 60,000 hunters ever worked the Southern Plains in precontact times is now unknowable, but Coronado's chronicler, Castaneda, wrote that there were more people on the Plains in 1542 than in the Rio Grande pueblos. Pedro de Castaneda, "The Narrative of the Expedition of Coronado," in *Spanish Explorers in the Southern United States, 1528–1543*, ed. Frederick W. Hodge and Theodore H. Lewis (Austin, 1984), 362. For a seventeenth-century population estimate in the Rio Grande pueblos of about 30,500, see Marc Simmons, "History of Pueblo-Spanish Relations to 1821," in *Handbook of North American Indians*, ed. Sturtevant, IX, 185 (table 1).

³⁹ For Thomas Fitzpatrick's report, see Berthrong, *Southern Cheyennes*, 124. The English traveler William Bollaert mentions that the Texas Comanches supposedly ate 20,000 mustangs in the late 1840s. See Hollon, ed., *William Bollaert's Texas*, 361. On the escalating stock raids and trade to New Mexico beginning in the 1840s, see J. Evetts Haley, "The Comanchero Trade," *Southwestern Historical Quarterly*, 38 (Jan. 1935), 157–76. Haley generally ascribes the situation to Comanche barbarity and Hispanic lack of respect for Lockean private property rights. See also Kenner, *History of New Mexican-Plains Indian Relations*, 78–97, 155–200.

⁴⁰ See James Mooney, *Calendar History of the Kiowa Indians* (Washington, 1979), 287–95; Levy, "Ecology of the South Plains," 19. The decline in the number of bison was becoming noticeable as early as 1844, two years before the 1846–1857 drought. See Solomon Sublette to William Sublette, Feb. 2, May 5, 1844, William Sublette Papers (Archives, Missouri Historical Society, St. Louis, Mo.). In 1845 the trader James Webb and his party traveled from Bent's Fort to Missouri without killing a bison. "Memoirs of James J. Webb, Merchant in Santa Fe, N.M., 1844," typescript, p. 69, James Webb Papers, *ibid.*

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).⁴¹ 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.⁴² 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.⁴³

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

⁴¹ John C. Ewers, *The Horse in Blackfoot Culture* (Washington, 1955). For systematic assessment of the effects of horses on seasonal band size, camps, and resources, see John Moore, *The Cheyenne Nation: A Social and Demographic History* (Lincoln, 1987), 127-75. For a dynamic rather than a static horse ecology, see James Sherow, "Pieces to a Puzzle: High Plains Indians and Their Horses in the Region of the Arkansas River Valley 1800-1860," paper presented at the Ethnohistory Conference, Chicago, 1989 (in Flores's possession). Clyde Wilson, "An Inquiry into the Nature of Plains Indian Cultural Development," *American Anthropologist*, 65 (April 1963), 355-69.

⁴² J. Frank Dobie, *The Mustangs* (New York, 1934), 108-9. Dobie's estimate, as he pointed out, was a guess, but my work in the agricultural censuses indicates that it was a good guess. On horse/bovine dietary overlap see L. J. Krysl et al., "Horses and Cattle Grazing in the Wyoming Red Desert, I. Food Habits and Dietary Overlap," *Journal of Range Management*, 37 (Jan. 1984), 72-76. On the drier climate on the Plains between 1848 and 1874, see Weakly, "Tree-Ring Record of Precipitation in Western Nebraska," 817, 819; and Levy, "Ecology of the South Plains," 19.

⁴³ I follow Chapman and Feldhamer, eds., *Wild Mammals of North America*, 991-94.

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.⁴⁴

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.⁴⁵ 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.⁴⁶

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.

⁴⁴ McHugh, *Time of the Buffalo*, 226–27. For scientific discussion of predation by wolves on large ungulates, see David Mech, *The Wolf* (New York, 1970); see also Chapman and Feldhamer, eds., *Wild Mammals of North America*, 994–96. For estimates that the reintroduction of wolves to Yellowstone would reduce the bison herd there between 5% and 20%, see Barbara Koth, David Lime, and Jonathan Vlaming, "Effects of Restoring Wolves on Yellowstone Area Big Game and Grizzly Bears: Opinions of Fifteen North American Experts," in Yellowstone National Park, *Wolves for Yellowstone?* (n.p., 1990), 4–71, 4–72, and the computer simulation, 3–31. Young and Goldman, *Wolves of North America*, II, 327–33.

⁴⁵ Schulman, *Dendroclimatic Data from Arid America*, fig. 22; Weakly, "Tree-Ring Record of Precipitation in Western Nebraska," 817, 819.

⁴⁶ For emphasis on disruption by whites, see Douglas Barnforth, "Historical Documents and Bison Ecology on the Great Plains," *Plains Anthropologist*, 32 (Feb. 1987), 1–16. On the *Ciboleros*, see Kenner, *History of New Mexican-Plains Indian Relations*, 115–17. Jablow, *Cheyenne in Plains Indian Trade Relations*, 72.

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.⁴⁷

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.⁴⁸ 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

⁴⁷ My interpretation of the great 1840 alliance of the Southern Plains tribes has been much influenced by Jablow, *Cheyenne in Plains Indian Trade Relations*, 72–73; Levy, "Ecology of the South Plains," 19; Mooney, *Calendar History of the Kiowa Indians*, 276–346.

⁴⁸ John Whitfield, "Census of the Cheyenne, Comanche, Arapaho, Plains Apache, and the Kiowa of the Upper Arkansas Agency," Aug. 15, 1855, Letters Received, Records of the Office of Indian Affairs, RG 75, microfilm M234, reel 878 (National Archives). Letters between the principals at Bent's Fort make it clear that the Comanche trade in robes was Bent and St. Vrain's chief hope for economic solvency in the early 1840s. See W. D. Hodgkiss to Andrew Drips, March 25, 1843, Andrew Drips Papers (Archives, Missouri Historical Society).

explanation may also illuminate the experience of the Canadian Plains, where bison disappeared without the advent of white hide hunting.⁴⁹

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.⁵⁰

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

⁴⁹ Records on the robe trade are fragmentary and frequently at odds with one another; see T. Lindsay Baker, "The Buffalo Robe Trade in the 19th-Century West," paper presented at the Center of the American Indian, Oklahoma City, April 1989 (in T. Lindsay Baker's possession). John Jacob Astor's American Fur Company was taking in 25,000–30,000 robes a year from the Missouri River from 1828 to 1830, and St. Louis was receiving 85,000 to 100,000 cow robes a year by the end of the 1840s. Baker cannot yet estimate how many of those came from the Southern Plains, but the trend toward a larger harvest seems apparent. On the Canadian experience, see Ray, *Fur Trade and the Indian*, 228.

⁵⁰ Berlandier, *Indians of Texas in 1830*, ed. Ewers, 84–85. Thirteen epidemics and pandemics would have affected the Comanches between 1750 and 1864; see Dobyns, *Their Number Become Thinned*, 15–20. On the abandonment of Bent's first Arkansas River post, see Lavender, *Bent's Fort*, 338–39. John C. Ewers, "The Influence of Epidemics on the Indian Populations and Cultures of Texas," *Plains Anthropologist*, 18 (May 1973), 106. Ewers bases his decline on an estimated early nineteenth-century Comanche population of only 7,000. If my larger estimate is accepted, the Comanche population decline was more than 90%. A falloff in the birthrate as Indian women contracted Bang's disease from brucellosis-infected bison may have contributed importantly to Indian population decline.

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.⁵¹ 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.⁵²

In a real sense, then, the more familiar events of the 1870s only delivered the *coup de grace* 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.⁵³

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.

⁵¹ James W. Abert, *The Journal of Lieutenant J. W. Abert from Bent's Fort to St. Louis in 1845*, ed. H. Bailey Carroll (Canyon, 1941), 15–16; U.S. Congress, Senate, *Report of the Secretary of War, Communicating in Answer to a Resolution of the Senate, a Report and Map of the Examination of New Mexico, Made by Lieutenant J. W. Abert, of the Topographical Corps*, 30 cong., 1 sess., Feb. 10, 1848.

⁵² Richard I. Dodge, *Our Wild Indians* (Hartford, 1882), 286. The idea has lingered in the preserved mythologies of the Southern Plains tribes. In 1881 representatives of many of those tribes assembled on the North Fork of the Red for the Kiowa Sun Dance, where a Kiowa shaman, Buffalo Coming Out, vowed to call on the herds to reemerge from the ground. The Kiowas believed the bison had gone into hiding in the earth, and they still call a peak in the Wichita Mountains Hiding Mountain. Alice Mariott and Carol Rechlin, *Plains Indian Mythology* (New York, 1975), 140; Peter Powell, *Sweet Medicine* (2 vols., Norman, 1969), I, 281–82. There is no mention of this idea in the major work on Comanche mythology, but it is far from a complete compilation: Elliott Canonge, *Comanche Texts* (Norman, 1958). On the bison's wintering in protected canyons, see Randolph Marcy, *A Report on the Exploration of the Red River, in Louisiana* (Washington, 1854), 125–31.

⁵³ Wallace and Hoebel, *Comanches*, 32; Richard I. Dodge in *The Plains of North America and Their Inhabitants*, ed. Wayne Kime (Newark, 1989), 155–57. On these figures for bison, see Roe, *North American Buffalo*, 440–41.