

CENTER FOR PUBLIC HISTORY AND ARCHAEOLOGY, COLORADO STATE UNIVERSITY

The Environmental History of Sand Creek Massacre National Historic Site

Final Draft

Elizabeth Michell

July 31, 2009

An abbreviated version intended as a guide for visitors

INTRODUCTION

On a late spring day, a visitor stands on a slight rise on the banks of Big Sandy Creek across from where Cheyenne chief Black Kettle's village once stood. "A whole lot of nothing," he comments laconically. It is a quiet place, its peacefulness giving it a timeless quality. But the visitor is wrong, and the timelessness is deceptive. You can never visit the past again. The Sand Creek Massacre National Historic Site is in southeastern Colorado, about fifteen miles northeast of the small town of Eads. This is high plains country, dusty and flat, the drab greens of grass and scrub melding into the relentless browns of desiccated vegetation, sand, and soil. The surrounding landscape is crisscrossed by dirt trails and fence lines, dotted with windmills, outbuildings, and stock watering tanks. At the site, groves of cottonwoods tower along the gently sloping banks of Big Sandy Creek – in fact, it would be difficult to follow the stream course without the line of trees. For most of the year, water does not flow and the creek bed is choked with sand sagebrushes and other dry prairie species. Though the site is part of a shortgrass prairie, most of the land is actually sandy bottomland that may eventually become a tallgrass prairie. It was dry in Black Kettle's time, and it is still dry, evident by how much more sagebrush species there are now than in the nineteenth century. And for those who think not much has happened in the last 140 years, the remains of an ambitious, early-twentieth century irrigation project squat low on the horizon.

It would not be a particularly interesting place but for one reason. Over 150 Cheyennes and Arapahos were massacred here in 1864, and for descendents, that loss is eternal. For the rest of us, to see the Sand Creek Massacre site today is to begin to understand that landscapes never stand outside of time and history, and that features and

changes can be imbued with values and meanings far beyond their physical manifestations. The site – with its flora and fauna, its soils and water, its topography, its agricultural remnants -- is the physical embodiment of the conflict between two cultures that had very different philosophies about what land meant and how it should be used. We can stand here, look at the environment around us, trace the changes through the centuries, and hope to catch a glimpse of history.

THE PLAINS

Feel the sky touch both shoulders
 Savor the sage colored scruff, the sandy saged scrub
 Etched with dusty trails and the sharp, black smudge of cattle
 Wrapped in and wearied by the dreams that drove us this far,
 We wonder alone when the lightening will strike and the heavens open . . .

A modern-day traveller in the late 1990s, in a modern-day stagecoach, crossing eastern Colorado as so many others had done. For writer Mimm Patterson, and for many in the generations before her, the plains were on the way to something else. Two hundred years before she made her journey, Major Stephen Long wrote – much less poetically – of this desert, “tiresome to the eye, and fatiguing to the spirit” Not so, countered Dr. Ferdinand V. Hayden (“the businessman’s geologist”): it was a garden, a place of “almost unlimited future.” Two men, two opinions, fifty years apart. Before the nineteenth century was over, politicians and land promoters had given the Great Plains an ideologically-driven makeover, placing the landscape within a new American creation myth. The plains became a space that reflected American energy, force, vitality. And in the wake of the Civil War, it became a place for unity and homogeneity, in which things

like “desert” or Indians had no business existing. In dry science-speak, however, the plains were neither wasteland nor Eden.

The Sand Creek Massacre site is part of the Colorado Piedmont, a section of the Great Plains in eastern Colorado that extends from just below the Arkansas River in southern Colorado to the South Platte River in the north, and from the Rocky Mountains in the west to the Kansas state border in the east. In these two river valleys, water and wind are the two greatest natural forces that have shaped the landscape. The Arkansas River has carved through geologic time and removed huge volumes of sediment, and harsh northwesterly winds have in turn dispersed the sand and silt from the floodplains over much of the Colorado Piedmont. In the Big Sandy Creek Valley, the underground layers consist of shale, clay, silt, sand, and gravel, and these are covered with overlying dune sand. But underneath all that sand and soil is a surprisingly robust network of artesian flow that rise to the surface as springs and ponds, and these fresh water sources have supported various life forms over the centuries.

In addition to geological forces, climate has also shaped the high plains grassland. The Great Plains spread west from the 100th meridian, the invisible line where John Steinbeck thought “the map should fold.” It is the edge of the east, and it marks the traditional boundary between eastern humidity and western aridity, between forest and grass. Today, the Great Plains is semiarid, in general receiving less than 24 inches of rain, with most of it receiving less than 16 inches. The Sand Creek Massacre site itself receives about 13 inches a year. But this aridity was not always the case. Various climatic changes during the Pleistocene era (approximately 1.6 million BCE to 10,000 BCE) helped make the high plains a habitable, even bountiful, land. From 20,000 to

14,000 years ago, spruce forests covered the region and extended as far south as Kansas. When the ice sheet retreated, so did the forests. For the past 8,000 to 10,000 years, the land has been prairie, home to people, animals, and a wide variety of vegetation. And during that time, the land has also seen its share of climate changes.

Around 9000 BCE, a warming trend began that coincided with the “Pleistocene extinction,” when approximately 73 percent of all North American mammals weighing over 100 pounds became extinct. This warming also transformed the plains into a lush, mixed savanna dotted with ponds, marshes, and streams, and hunters moved seasonally through the land chasing the larger ancestors of the modern bison. A few thousand years later, the dramatic Altithermal began. The climate became hotter and dryer, and the amount of surface water in the Great Plains sharply declined. The nomads dug deeper and travelled farther to find water, and their main food, the bison, evolved into the modern *Bison bison* – a smaller animal that matured faster, required less food and water, and wandered more. Then around 700 to 800, the region entered a wet period, and the grassland spread about 200 to 300 miles into west central Kansas and Nebraska. As the grassland moved, so too did agriculture and by 1000, families were subsistence farming along the Republican, Solomon, and Smoky Hills rivers. For the first time in Plains history, a sedentary population that cultivated maize, beans, squash, marshelder, and sunflowers occupied the high grass plains as far west as eastern Colorado and the Nebraska panhandle. These people of the Plains Village period also harvested wild plants and herbs, and continued hunting game ranging from bison to jackrabbits. By the thirteenth century, the plains were again in a dry phase that lasted into the sixteenth century, though even within this dry period there were series of wet years, for example

those centered in 1321, 1613, and later in 1829. The grasslands receded back to the east, and took the agricultural families with them. When the agricultural tribes left, nomadic people again dominated the high plains, living off the seemingly endless bison herds.

The seeming immutability of the land was thus an illusion. For millions of years natural forces had been at work, and different life forms -- ancient megafauna, modern mammals, human populations -- had placed different demands on the high plains ecosystem. What the plains looked like in 1864, and what it looks like today, is the result of centuries of human-environment interactions, and of how different groups of people made decisions that allowed them to live within -- and sometimes beyond -- the land's carrying capacity.

EUROPEANS DISCOVER THE PLAINS

One summer day more than three hundred years before the massacre, a Spanish nobleman surveyed the apparently endless expanse of land he had been riding across for weeks, and resigned himself to another day of no water and yet another meal of bison cooked over dried dung. It was 1541, and Francisco Vázquez de Coronado and a small detachment of soldiers from Mexico City were on the trail of the fabled city of Quivira. The journey into what is now south central Kansas had been grueling and disorienting. They had trudged over the Llano Estacado, a mind-numbingly featureless stretch of land in west Texas. Those plains, Coronado wrote, had “no more landmarks than as if we had been swallowed up in the sea, where they [the guides] strayed about, because there was not a stone, nor a bit of rising ground, nor a tree, nor a shrub, nor anything to go by.” As

the days wore on, Coronado had the growing suspicion that one of their guides – the Plains Indian nicknamed “the Turk” -- had lied to them.

In present-day Rice and McPherson counties, the Spaniards found only a few villages of grass huts. They were not impressed. The country itself was reasonably fertile, with good grass, grapes and mulberries, watered by rivulets and springs -- but there were no treasures. A depressed Coronado reported to his king that he had done his best, but the nearly naked barbarians and their world would seem on the whole to be of not much use to anyone. No gold, no glory, no god, but a timeless emptiness in which to contemplate all three. Coronado had the Turk garroted.

The initial European expedition seemed almost a non-event, for when Coronado found no treasures, Spain did not bother to send another foray for forty years. But for the Plains Indians, the non-event was momentous, for they saw the horse, and they saw their future. The smaller ancestor of the modern horse had ranged over the plains from 15 million years ago until 10,000 years ago when, like most other large Pleistocene mammals, it vanished from the record. Before the horse disappeared from North America, however, it made its way to Asia and Europe, where over a few thousand years it became domesticated. The horse that the Spaniards re-introduced was a larger and more powerful animal with a historical and genetic link to the land, and thus “pre-adapted” to the conditions of the plains. These horses were originally confined to Spanish settlements on the Rio Grande, but especially after the great Pueblo revolt of 1680, many horses escaped to the southwestern plains. From there, the feral horse herds thrived and gradually spread north in the eighteenth century. By 1850, there were perhaps two million wild mustangs on the loose between Texas and the Arkansas River

Valley, and this did not include the large number of horses owned by plains tribes. The problem was that the grassland was *not* endless, and the animals the natives relied on for transportation and for hunting competed fiercely for resources with the animals they hunted for food and trade. An ecological disaster was brewing, and no one seemed aware of it.

The general environmental conditions on the high plains during the nineteenth century were much like they are today – the area received from 12 to 20 inches of rain per year (more towards the east, less towards the west), and the daily temperatures could vacillate anywhere from a 50° to a 100° change in one day. The major difference between then and now, however, was that between 1700 and 1850, an explosive expansion of different cultures occurred in the central plains, resulting in a doubling of high plains population between 1820 and the mid-1850s. The Spanish emerged from the southwest; the French -- and later the British -- entered from the east and northeast; and, most famously, American pioneers pushed directly from the east. In addition to the European population growth, several native tribes also moved into the region during this period. Many factors came together to entice the tribes onto the high plains early in the nineteenth century, and in a matter of a few decades, many factors beyond their control led to the failure of the plains to provide the resources necessary to support them.

CHEYENNE MIGRATION INTO THE PLAINS

The Cheyennes moved into the Plains in a series of migrations between the seventeenth and nineteenth century, first leaving their farms in the upper Mississippi River to settle in the upper Missouri Valley near the Black Hills, then drifting south into

the Arkansas River Valley around 1830. Various conditions on the plains lured the Cheyennes into the region, conditions that, in one way or another, were all tied to the environment. West of the 100th meridian, the nutritious shortgrasses – the buffalo and blue grama – covered the prairies. These grasslands, enriched by above-average rainfall from about 1815 to 1845, nourished a variety of wild game, including bison, deer, antelope, and bears, not to mention abundant wild horse herds. These horses provided not only locomotion, they also represented wealth and power. They transformed the Cheyenne from a sedentary people into nomadic hunters who could range far and wide for the all-important bison. But reliance on the horse also meant that the Indians were tied to a rigid annual cycle geared towards the needs of the animal. In the spring, the natives had to find the first green grasses near streams to feed their winter-weakened horses. By summer, the bands herded the horses to higher pastures to graze on the most favored shortgrasses, for only then could the fattened horses carry them on their extended bison hunts. In the autumn, the bands drifted back down into the valleys, seeking meager forage and shelter for the winter along protected river bottoms. Horses permitted the Cheyenne people to travel farther and faster in pursuit of buffalo, but because the plains could only support small bands who moved seasonally through the landscape, their new lifestyle further eroded their common identity as the Called Out People. Thus, while environmental conditions created new opportunities for wealth, they also helped alter Cheyenne society forever.

The arrival of European trade goods was yet another incentive that drew the Cheyennes to the plains. After Mexican independence in 1821, traders established the 800-mile Santa Fe Trail as the major commercial artery between the United States (Old

Franklin, Missouri) and Mexico (Santa Fe, New Mexico). In 1833, brothers William and Charles Bent, together with their partner Ceran St. Vrain, opened Bent's (Old) Fort on the Santa Fe Trail. Bent's Fort, on the north shore of the Arkansas River, became *the* trading post on the central plains. Here the Cheyennes traded horses and buffalo robes, and accessed other goods such as firearms and tools. They became the middlemen between European traders and tribes that lived farther north and west. Trade relations became particularly promising for the Cheyennes after William Bent married Owl Woman, the daughter of White Thunder, the "Keeper of the Arrows."

The Cheyenne did not move into a void, for other tribes also followed the bison and horses. During their migration southward the Cheyennes formed a close and enduring alliance with the Arapahos. The Arapahos had been an agricultural people in northwest Minnesota before they moved to the Black Hills region. Like the Cheyennes, they too began moving south under increasing pressure from the Lakotas, who became the dominant tribe on the northern plains. By the 1820s, the Arapahos were living mainly in the watersheds of the Platte and North Platte rivers while wintering on the South Platte. As the Cheyennes and Arapahos ranged south, they competed and fought with other native peoples, in particular the Comanches and the Kiowas from the south, as well as the Pawnees from the east.

As all of the forces involved in the decline came together – people, horses, bison, and climate -- the plains ecology began to unravel. In addition, the drought from 1845 to 1856 could not have occurred at a worst time, for as noted above, the plains were playing host to expanding native populations, greater numbers of horse herds, and rapidly increasing number of pioneers. The huge swell of overland migration in the mid-

nineteenth century may have formed the final, unremitting assault on the plains ecosystem.

AMERICAN OVERLAND MIGRATION

Despite the increasing trade with Mexico, Americans were eager for physical expansion. The United States went to war with Mexico from 1846 to 1848, and with the Treaty of Guadalupe-Hidalgo, increased its land holdings to include nearly all of the modern-day American West. The California gold rush then provided the impetus for the beginnings of mass migrations west. In April 1849, approximately 30,000 dreamers set out across the plains in search of their fortune.

The land these men trudged through on their way to the gold fields may have been new to them, but it was not unknown, for traders and explorers had traversed and mapped this territory years before. In 1806, Lieutenant Zebulon Pike explored parts of the Arkansas River Valley while on a government mission. In November, he was camped on the Arkansas River near present-day Garden City, Kansas. He wrote in his journal that “the face of the prairie was covered with [bison], on each side of the river; their numbers exceeded imagination.” It was early winter, and he noted that the company needed to rest their horses, “the herbage being very poor.” As the party neared Big Sandy Creek, “[the] river banks begin to be entirely covered with woods on both sides, but no other specie than cotton wood.” This was the “Big Timbers” of the Arkansas River, favored camp grounds for the Cheyennes and Arapahos. Pike had actually noted cottonwoods growing as far east as the Kansas-Colorado border, but as we shall see from later accounts, the Big Timbers of the Arkansas receded farther and farther west as the nineteenth century

progressed. When Zebulon Pike summed up his journey, he thought the plains “may become in time equally celebrated with the sandy deserts of Africa,” and that the land west of the Mississippi and Missouri was best left “to the wandering and uncivilized Aborigines of the country.”

Zebulon Pike’s journey was not the only government-sponsored expedition. In August 1845, Lieutenant James William Abert led a reconnaissance party on a journey through parts of the southwest. While still at Bent’s Fort preparing for the trip, he attended a peace conference between Cheyennes and Delawares. At the meeting, Cheyenne leader Old Bark made a speech that touched on the state of the land:

The whites have been amongst us, and destroyed our
buffalo, antelope, and deer, and have cut down our timber;
but we are so desirous to keep peaceful that we take no
notice of it

As the expedition got underway, Abert reminded his men to be careful with their provisions and cautioned them of “the consequences of waste in a land where one cannot even rely upon finding buffaloes.” They encountered an Apache warrior, who told the soldiers that his hunting party had not been able to find game for the last few days and that the women and children were starving. At the junction of the Purgatory and Arkansas rivers, Abert commented on the use of trees by the natives:

We were astonished at seeing great numbers of fallen trees,
but afterwards learned that the Indians are in the habit of
foraging their horses in winter on the tender bark and young
twigs of the cottonwood.

Perhaps the grasses in the region were not supplying enough energy to sustain the increasing horse herds through the winter. But Zebulon Pike’s party had also fed their horses on tree cuttings when they travelled through the plains in the winter of 1806, and

they were at least 60 miles east of the Arkansas-Purgatory junction. Either Abert was not familiar with the practice of using trees as supplementary diet, or he was surprised by the *amount* of trees used on a sustained basis as forage. Were the grasses failing even 40 years earlier, or was this typical of winter conditions on the plain in any given year?

Winters certainly were harsh, but when combined with drought, the effects on available forage could be devastating. This may explain what Abert observed on his expedition. Historians using older tree rings studies have speculated that droughts during the mid-nineteenth century contributed to decreased forage as well as decreased bison population on the plains. This is supported by recent data that indicate a relatively small but persistent drought occurred on the western plains and was particularly severe during the years 1845-1848, 1851, and 1855-1856.

Not all early travellers were government explorers and surveyors; in fact, much of the surviving accounts were written by civilians. Eighteen-year-old newlywed Susan Shelby Magoffin accompanied her wealthy trader husband to New Mexico in June 1846. In her diary, she recorded the various wildlife she encountered, including wolves, antelope, and buffalo. She spotted the first bison herds close to Walnut Creek (near present-day Great Bend, Kansas), and also noted that there the grass changed from tall grasses to a shorter and finer grass. Just prior to her arrival at the Arkansas River in July, close to Cow Creek (near Lyons, Kansas), Magoffin stated they were “out on the prairie with no wood and little water.” Farther along, between Walnut Creek and Pawnee Fork, there was no water in Ash Creek, and the road was very sandy and poorly timbered until they were 120 miles from the river crossing at Bent’s (Old) Fort.

By the end of the 1840s, the United States had annexed much of the American West and established numerous army posts throughout the region. These posts, and the men they supported, placed their own demands on the dwindling resources of the plains. In addition, during the four decades between 1819 and 1859, approximately 200,000 white travellers ventured west using the trails located along the Platte and Arkansas rivers. After reports of gold strikes in Colorado, 100,000 migrants set out on these trails in one month alone in 1859. Charles C. Post, a lawyer from Decatur, was one such “fifty-niner.”

Charles Post travelled along the Santa Fe Trail beginning in May 1859, and stopped at many of the same places as did Susan Shelby Magoffin. He saw the first buffalo herds farther east than did Magoffin, and gave a thrilling description:

We were aroused at day break by the cry “Buffalo! Buffalo!!” from our guard and got up to keep them from stampeding our oxen. The whole of the vast plains seemed alive southward.

At Cow Creek, Post commented on the same short grass Mrs. Magoffin had also noted, and speculated that the “grass is very short, kept so by the great number of buffalo which were in sight in innumerable herds at sunset.” Cow Creek had plenty of water and was thus immensely popular, with “some two hundred teams encamped along [it], some going to and some turning back from the Peak.” Walnut Creek, however, had no water “except slew water, which [was] so thick we could almost pick it up” This had not been the case in 1846 when Mrs. Magoffin’s party forded the “deep water” of the creek at a point 8 miles from the Arkansas River. Between Walnut Creek and Fort Atkinson, Post’s party travelled on sandy soil, and generally enjoyed good water and grass. Taking the fork that kept along the Arkansas River, Post commented on the presence of sage weed, flowers,

prairie dogs, pig weeds, red root, and parsley, but noted there was no timber. In fact, his party did not encounter trees until the Big Timbers, which now began farther upstream between the mouth of Big Sandy Creek and present-day Lamar. There they luxuriated in the shade after “not having enjoyed shade for one hundred and seventy-five miles.”

These accounts make it clear that the plains were an uncertain place during the best of times. As Zebulon Pike’s 1806 report shows, winters were harsh even in the years before the land experienced full human use and abuse. Pike’s party had encountered poor forage, but this would not be unexpected for winter. However, mid-century travellers commented on the poor grass during the peak spring and summer seasons. While sojourning at Bent’s (Old) Fort in 1859, Dr. George Willing (a physician and “fifty-niner”) noted that “[g]rass has been failing along the road for one hundred miles or more, and it grows scarcer we are told as we advance.” As well, water availability during the summer could be erratic despite the many streams and creeks. For example, Ash Creek was completely dry in 1846, while Cow Creek had good water in 1846 and in 1859, and Walnut Creek, though a deep crossing in 1846, was mostly mud in 1859.

Overland accounts also contain conflicting information about bison populations. Various natives Abert encountered had complained of shortage of bison, but Mrs. Magoffin noted that once in “buffalo country” her party constantly encountered buffalo, sometimes only three or four, sometimes herds of more than fifty. Near Coon Creek (about 30 miles west of Pawnee Fork), she saw “great many buffalo, (some thousands).” Charles Post, however, encountered buffalo herds farther east in Kansas than did Mrs. Magoffin. How, then, do we reconcile these conflicting accounts? It is true that bison like to wander – and do so unpredictably -- but human traffic probably also frightened

them away from well-travelled areas. Further, encountering pockets of several thousand buffalo would not have been uncommon in the 1840s, since the peak buffalo population in this region would have been between three and five million animals. On the other hand, the buffalo herds were already under stress due to exotic diseases, increased competition for forage, and human predation. In addition, drought conditions -- which could decrease the productivity of shortgrass prairie by as much as 90 percent -- may also have contributed to the decrease in bison number. All these factors could explain the inability of Abert's Apache party to find game, the dry creeks, the poor forage, and the eastward retreat of the herds.

As the thousands of wagons and animals jammed the trails, the plains environment steadily deteriorated. With the travellers came litter and detritus, as emigrants simply discarded items – and animals – that they no longer needed or that weighed them down. They used up every imaginable resource along the well-worn routes. They cut down trees for fuel, and when the timber ran out they used buffalo chips. Their horses, oxen, and mules grazed voraciously on whatever forage they could find in the immediate vicinity of the trail, and they did so along every inch of the trail. Imagine, then, the additional pressure exerted by this mass migration on an already fragile ecosystem. This was especially apparent in riparian areas, for it was along the river courses that overland migrants travelled. It was this ruined ecosystem that the Cheyennes and Arapahos depended upon for survival in the winter of 1864.

SAND CREEK MASSACRE, 1864

Relations between the Plains Indians and Anglo-Americans were testy at best, and had been steadily deteriorating since the mid-nineteenth century with increasing white encroachment into traditional hunting grounds. The summer of 1864 proved a particularly trying time. Territorial Governor John Evans had great ambitions for Colorado – he wanted control of the eastern plains, widespread agrarian settlement, and ultimately, statehood. But first, he had to take care of the “Indian problem.” That summer, frustrated by Indian raids on outlying settlements and along roads leading to Denver, the governor appealed to the federal government for aid. He finally received permission in August to raise a company of “One Hundred Day” U. S. Volunteer Cavalry, and recruitment posters especially targeting “Indian Fighters” immediately went up all around the territory.

Meanwhile, the natives were receiving mixed signals, for Governor Evans had also sent out a call for “friendly Indians of the plains” to separate themselves from hostile factions and to camp near designated military posts for provisions and “protection.” And some peace-inclined Cheyenne and Arapaho bands proceeded to do so, with ambiguous results at best. In late October, Cheyenne leader Black Kettle took a small contingent of followers from his camp at Big Sandy Creek to Fort Lyon, expecting rations and assurances of peace. Major Anthony told the Cheyennes that he did not have the authority to make peace with them, and moreover, he could not permit them to remain near the fort. He did, however, approve of their main campsite at Sand Creek since it was far enough away from Fort Lyon to not cause problems. The Indian camp was on a bleak, windswept stretch of prairie just outside the northern and eastern boundaries of the

reserve established for the Cheyenne and Arapaho tribes by the Treaty of Fort Wise in 1861. Here, on 29 November 1864, Colonel John Chivington led his pre-dawn assault on the unsuspecting villagers.

On an ordinary winter morning, the day would have begun at dawn with villagers drawing water and building fires, and boys bringing in the pony herds that had been grazing overnight on the prairies surrounding the camp. It was not the most bountiful of places. Game was scarce in the area, and warriors mounting a winter hunt had to travel quite a distance – perhaps as far as the Smoky Hills River region – to hunt bison. Trees were also rare, though the occasional cottonwood provided emergency forage for horses, and villagers collected dried bison dung from the surrounding prairies for their camp fires. Fresh water was also problematic -- the creek was called the Big Sandy Creek for a reason. It was dry most of the year, and now, in early winter, the wide creek bed meandered between tall, bare banks, the sandy bottom punctuated only by occasional pools of water.

The grass was brown, trampled and chewed, and the villagers' herds – perhaps as many as two thousand horses and mules -- had to forage two or three miles away. Although still at the beginning of winter, they were already a scrawny-looking lot. But, the Cheyennes and Arapahos knew this land well, for it was on the old lodge pole trail that ran between (old) Fort Lyon on the Arkansas River and the headwaters of the Smoky Hill River, and it served as a “way station” for bands moving between the “Big Timbers” of the two major rivers. The bluffs carved out by the creek protected their tipis from the fierce prairie winds, a spring a short distance from the camp provided precious fresh

water, and with enough care, the people could make food, fuel, and forage last through the unforgiving season.

But for the some five hundred Cheyennes and Arapahos, that winter day began and ended in blood and chaos. It was a clear morning, and as the soldiers approached from the south, the prairies stretched endlessly in every direction, with rolling hills that sometimes obscured what lay just over the horizon. Three miles before reaching the camp, they saw large herds of ponies grazing on both sides of a mostly dry stream. The sandy creek bed was about a quarter of a mile wide with sagebrushes here and there, and some piles of driftwood. On the other side of the creek to the northeast, the main village came into view, the tanned bison hides of a hundred tipis gleaming white in the early morning sunlight. At the village, the creek banks were two to five feet tall, but they gradually increased to as much as twenty feet in height as the stream wound north, with steep, almost perpendicular sides. After one final exhortation from the colonel, the soldiers descended to the broad creek bottom. The day had begun.

ENVIRONMENTAL CONDITIONS, 1864-1900

The descriptions above of the massacre site in 1864 is an educated guess, a compilation gleaned from eyewitness and survivor stories, traveller accounts from surrounding areas, and modern-day scientific studies. Most eyewitnesses – army commanders, soldiers, Indian agents – wrote from the white viewpoint, their narratives concerned with the military action immediately before and during the massacre. If the Americans were not paying attention to the landscape, neither were the Indians. As Cheyenne descendent Elsie Standing Elk Wick noted, environmental features “weren’t

important enough to mention because of the event. That became more important than stating there was water here or that kind of thing. The murder of the people was too prominent.” She is certainly right that the massacre of her ancestors *is* much more important than worrying about the number of trees or horses or whether the creek was dry or not. But reconstructing the conditions at the site is not just an academic exercise, because how much rearrangement the environment had to make in response to human demands had everything to do with what happened to the Cheyennes and Arapahos nearly 150 years ago. In the competition for resources, the native peoples were locked in a struggle with new settlers from an expanding nation who vowed complete sovereignty. The Sand Creek Massacre became the symbol of that deadly drive for political, economic, cultural, and environmental dominance.

In the years leading up to the massacre, American officials were certainly aware of the Indians’ plight, even if they did not necessarily understand the implications of environmental stress for the general population. In June 1861, Indian Agent A.G. Boone told Governor William Gilpin that the Cheyennes were “destitute” and “near starvation,” and later in August, he reported that “game is fast disappearing from their Country.” Just a few years later, Major Scott Anthony testified that the arms he confiscated from the natives at Fort Lyon in early November, 1864, were “in very poor condition, and but few, with little ammunition,” and their horses were “below the average grade of Indian horses.” In fact, he continued, the Indians “could make but a feeble fight if they desired war.” From these reports, it would seem that by 1864, prayers and giving thanks were no longer enough to guarantee the generosity and reciprocity of the land. The Cheyennes and Arapahos had lost control of the land, and hence control of their future.

Surrounding Regions

Historic details of environmental conditions at the Sand Creek Massacre site are rare. There are, however, reports written by travellers crossing the plains who were *near* but not *at* the site. One route that took travellers relatively close to Sand Creek was that used by the Butterfield Overland Despatch [sic], a freight and passenger line established by David Butterfield in 1865. It ran from the Missouri River, across Kansas, and on to Denver. The BOD had stations on Big Sandy Creek, but the closest station to the massacre site was located 15 miles north of it. In the summer of 1865, Lieutenant Julian R. Fitch of the U.S. Signal Corps wrote a glowing report of the land he passed through while riding the BOD. The Smoky Hill region, he said, was the “garden-spot and hunting-ground of America bountifully supplied with wood, water and grass,” and the land between the Smoky Hill River and Big Sandy Creek also had a large stream and good forage. Journalist Bayard Taylor, who also took a trip on the new line, wrote about various stops on the route. Dubois Station, about 24 miles southwest of Cheyenne Wells, was the first station on Big Sandy Creek. There Taylor found the two caretakers “living in a hole in the ground, with nothing but alkaline water to offer us.” All the land was covered with weeds and cacti, and “even the buffalo-grass died out.” At the dismal Grady’s Station eighteen miles farther north, “there was but one man, a lonely troglodyte, burrowing in the bank like a cliff swallow.” The descriptions of “holes in the ground” and burrows in the banks indicate that at these locations 15 to 35 miles *north* of the massacre site, the land along the creek appeared to have been loamy or alkaline plains. At Sand Creek, however, eyewitnesses consistently described the prevalence of sandy

soil. The creek bed and banks were sandy, the hills west of the creek were sand hills, and at half a mile from the village, the soil was also sandy.

As for the land south of the site, Major Samuel G. Colley, an agent for the Cheyennes and Arapahos, left a description of the Indian reservation that the United States government had established in the Treaty of Fort Wise (1861). The reservation was a triangular tract of land bounded roughly on the south by the Arkansas River, and north and east by Big Sandy Creek; the original Fort Lyon was located within its boundaries. According to Major Colley, “no buffalo [had] been seen there for three or four years,” and there was only enough timber for firewood but not for buildings or fences. Permanent streams were rare on the reservation, but the land along the Arkansas would make good farmland because the river provided a reliable water source for irrigation. Although the land seemed barren, Colley thought the rest of the reservation would make good stock country since it had plentiful buffalo and grama grasses -- he claimed that the “stock [kept] fat all winter without feeding.”

For Major Colley and most white observers, native peoples did not really have a choice about living on reservations – it was the only logical option. If they ever did have a choice, the time was long past. In 1846, the venerable Cheyenne leader Yellow Wolf had seen General Stephen Kearney’s Army of the West march along the Santa Fe Trail on its way to the Mexican-American War. The old warrior understood the implications of the army and the growing number of white people in his land. He realized, as few of his people did, that the Cheyennes would not survive if they did not somehow wean themselves from their nomadic lifestyle and adopt the ways of the white people. By 1864, Yellow Wolf’s fears had come true, and the bison herds the Called Out People had

always depended on for food, shelter, and trade were gone not just from the reservation land, but had been decreasing in Colorado for a decade or more.

Bison

Bison herds once grazed just about everywhere from California to the Atlantic coast. In the early 1830s, there were no longer any bison east of the Mississippi, but 30 million or so still lived on the plains. But as early as 1853, Cheyenne and Arapaho agent Thomas Fitzpatrick reported that the tribes in his district were starving for half the year. By the 1860s, the herds were clearly in decline for a number of reasons, including an extended drought from the mid-1840s to mid-1850s, increased Indian hunting for the buffalo robe trade, selective killing of buffalo cows (cows had more flavorful meat and more pliable hides), new diseases, habitat disturbance by emigrants and settlers, and increased grazing competition from stock and horses. At the time of the massacre, the herds had retreated eastward well into Kansas. In addition, the post-Civil War era saw an explosion of bison hunting by Anglo-American “buffalo runners” that took the animal to the brink of biological extinction. By 1885, there were less than 1,000 bison left in the wild.

Billy Dixon was one such buffalo runner who hunted bison for eastern markets, but at the same time deplored the killing of the animal for sport. From 1870 to 1872, Dixon hunted bison in the same areas that the Cheyennes claimed as their land, primarily western Kansas around the Saline and Solomon rivers. As the bison became scarcer in the north, he began to look for them farther south, sometimes even venturing south of the Arkansas River despite the provisions of the Treaty of Medicine Lodge Creek (1867). In

the fall of 1872, Dixon wrote about what he called “the high tide of buffalo-hunting” near Dodge City:

The noise of the guns of the hunters could be heard on all sides, rumbling and booming hour after hour, as if a heavy battle were being fought. There was a line of camps all the way from Dodge City to Granada.

Dixon thought that during the fall and winter of 1872-1873, hunters may have killed 75,000 bison within 60-75 miles of Dodge City. At a gathering of buffalo runners in 1874, the hunters agreed that they would probably never see such a “big run of buffalo that far north, because of the enormous slaughter on that part of their range in 1872 and 1873.” Colonel Richard Irving Dodge wrote about that same slaughter in the fall of 1873: “[W]here there were myriads of buffalo the year before, there were now myriads of carcasses . . . the vast plain which only a short twelve months before teemed with animal life, was a dead, solitary putrid desert.” In the early months of 1873, Dixon decided to look for fresh hunting grounds north of the Arkansas River, but ended up on a “wild goose chase” as he followed White Woman’s Creek (between the Arkansas and Smoky Hill rivers in western Kansas) into eastern Colorado and over to Big Sandy Creek. His party camped at the massacre site one night, and Dixon recalled that they could still see bones scattered over the land.

The extermination of the bison had important political, cultural, and ecological ramifications. The reality was that once the bison were gone, the tribes would lose whatever economic autonomy they had left and be confined permanently to their reservations. It may not have been official policy, but army commanders in the west certainly understood what they needed to do. In 1868, General Philip Sheridan – then in command of the Department of the Missouri – wrote to his friend General William T.

Sherman: “The best way for the government is to now make [the natives] poor by the destruction of their stock [buffalo], and then settle them on the lands allotted to them.” But the bison was important to Plains people not just as food or as a trade commodity. The buffalo held a special place in Cheyenne culture, for the All Being created it as the one creature that could take the place of all the other animals in meeting human needs. The annual Sun Dance was in part a ceremonial reconciliation between the bison and the people it sustained, with the bison an important symbol of the kinship between all life forms and the land.

This kinship between life and the land was ruptured by the extermination of the bison. The present-day bison may have been rescued from the brink of biological extinction, but it is ecologically extinct within its natural range. Many scientists consider the bison to have been a *keystone species* – that is, species critically important in maintaining the health and vitality of their ecological communities. The bison certainly occupied an important niche in the Great Plains, and when they disappeared, grasslands ecology changed forever. Scientists speculate that some populations of grassland birds – for example the mountain plover, which relies on low vegetation cover for forage and detecting predators -- have declined because of changes in habitat that were partly dependent on bison grazing patterns.

Bison grazing also affected plant species distribution and productivity. Grasses enriched by bison urine have higher nitrogen content and are thus more nutritious, and bison preferred returning to these patches. This selective grazing in turn promoted the growth of non-forage plant species and increased patch biodiversity. As bison moved through the grasslands, they encouraged movement of these patches, thus also increasing

landscape-level biodiversity. In addition, the intensive grazing kept vegetation cover low. Low vegetation cover reduced loss of nitrogen through fires while also confining prairie fires to smaller patches. Even in death, the bison continued to affect the environment as their decomposing carcasses altered the immediate soil chemistry. In time, these patches eventually became very fertile with high nitrogen concentrations.

The bison itself changed as a result of its near-extinction. Today's bison – in the wild as well as in private herds – are descended from the approximately 1,000 animals left at the end of the nineteenth century. That, along with range fragmentation and cattle gene introgression, has resulted in a seriously depleted bison gene pool. Moreover, the gene flow continues to be artificially regulated and is subject to essentially idiosyncratic human preferences in meat production and game farming. This concern about bison genes is important because how much a bison really is a bison can have legal consequences, as for example, in wildlife legislations. In addition, the role the bison had in their former ecosystems continue to have implications for modern-day range management, in particular the issue of whether cattle can be considered ecologically and functionally equivalent to bison.

The last buffalo sighted near the Sand Creek Massacre site may have been killed in 1885 by a hunter named Youngblood stationed at Coolidge, a town just across the border in Kansas. He shot the animal near the Rush Creek-Big Sandy Creek junction, some twelve miles south of the site. The Russian Grand Duke Alexis had his royal hunt in this same valley between Rush Creek and Big Sandy Creek in 1872, when there were still “thousands” of bison. One could imagine that Youngblood's bison survived the entertainment of that day to roam for another dozen years. Maybe. But, this particular

animal died in 1885, and perhaps after death, its bones mingled with all the other buffalo bones that littered the prairie. In the 1910s and 1920s, homesteaders could still pick bones by the wagon load for the eastern fertilizer industry. In fact, Kiowa County pioneers claimed that the town of Brandon was well-known “for its shipment of bones and for having the best equipped railroad tracks in Colorado.” By the time this last bison died, it was an anomaly in the area around the massacre site. The plains of eastern Colorado had already been cattle range for many years, and shortly after, would also become farms for hardy homesteaders.

Timber

The bison were not the only species disappearing from the landscape. There may be large groves of cottonwoods at the massacre site now, but in 1864, there were far fewer trees, and eyewitness accounts emphasized the barrenness of the landscape. Descendent stories sometimes mentioned small groves or forests at the site, but army veterans who no longer remembered the exact location of the massacre nevertheless agreed that there were no trees, except perhaps a dead one on the creek bottom. Perhaps the strongest eyewitness source for a timberless landscape is a letter George Bent wrote to Joseph Thoburn in 1914. In response to a question regarding trees at Sand Creek, Bent replied, “[N]o timber on Sand Creek of any kind so I did not change the map because it is correct.”

The condition of the cottonwoods at Sand Creek may have echoed what was happening to the Big Timbers on the Arkansas River. In 1806, Zebulon Pike noted young cottonwoods sprouting along the Arkansas *east* of the Kansas-Colorado border, with major growths extending from near Holly, Colorado to the junction of the

Purgatoire. Thus, the Big Timbers lined the river for almost 60 miles. By the 1850s, most accounts of the grove placed its eastern limits upstream from Big Sandy Creek, near present-day Lamar. In the span of fifty years, then, the Big Timbers of the Arkansas River had receded approximately 30 miles west. Not only were the cottonwoods receding, they were also thinning – in 1853, Lieutenant E. G. Beckwith found the trees “not thick enough to obstruct the view.” Along with the decrease in living trees, travellers also no longer had access to driftwood as a fuel. Two Butte Creek, near Holly, was called “Piles of Driftwood” by the Cheyenne; by the 1850s, driftwood was a rare and precious find.

Yet there may have been some trees, if not in the immediate area of the village then in the vicinity, because the Indians would have needed a certain amount of firewood for cooking and heat. Just four years after the massacre, Lieutenant Samuel Bonsall kept a journal of a march from Old Fort Lyon to Cheyenne Wells. Approximately 12 miles south of the massacre site, Bonsall reported “plenty of driftwood” and “a few small cottonwood trees.” At the massacre site and to the north of it, he again commented on cottonwoods – albeit stunted ones -- growing along the banks of the creek. Modern scientific studies support the presence of at least *some* trees at Sand Creek. In a 2005 tree ring study for the National Park Service, Dr. Connie Woodhouse analyzed samples from cottonwoods that had been around for at least 75 years as identified by old aerial photographs. Her findings suggest that some of these trees may also have been alive in 1864.

Water

The Cheyenne name for Big Sandy Creek means “dry creek.” Then as now, it is an intermittent creek, with flowing water only after good rainfalls or periodic floods. These days, most of the creek bed is dry, overgrown with grasses and brush. In 1864, however, the creek bed was flat and sandy. It had little if any grass, and the banks were noticeably steeper – high and bare enough for some Cheyennes and Arapahos to dig protective pits during the massacre. Throughout the year, water showed above the sand in the creek in only a few places. According to George Bent and his maps of the site, one of the rare places with running water probably was the South Bend of the creek.

In Cheyenne tradition, however, the people always followed water. Thus, even if Big Sandy Creek had only scattered pools of water, the people would have made camp only if there were reliable springs near the village. Some oral histories support the presence of these other sources of water. According to descendent Laird Cometsevah, people and horses always had separate drinking water sources, and at Sand Creek, the pools in the creek itself were for the horses since the water was bitter and barely palatable. His father told him there was a spring to the northeast that fed into Big Sandy Creek, and this was the spring that the people used. Colleen Cometsevah remembered older relatives telling her that Cheyennes did not drink from water that stood overnight because certain spirits also drank from those containers, so they had to draw fresh water in the morning. The spring would have been close by because the women did not have water buckets, and it would have been too dangerous for them to stray far from camp. The separate spring theory is supported by the fact that there is indeed a perennial spring

to the east of the massacre site. When Laird Cometsevah flew over the area, he identified that spring as the water source his father had told him about.

RANCHING

This lack of reliable water sources certainly did not prevent settlers from heading into the plains, ready to coax life from an unforgiving land. Across the West, the Indian frontier disappeared as the natives surrendered their sovereignty in exchange for life on reservations. In southeast Colorado, cattle ranchers and homesteaders replaced the Cheyennes and Arapahos, assured by people such as Samuel Aughey, a professor of natural sciences at University of Nebraska, that “repeated experiments and observations” proved rain did indeed follow the plow:

. . . . the moisture and rainfall is gradually increasing from East to West, by the constant operation of laws and forces that will certainly accelerate until the great areas before mentioned have their plenum, as in the states east of the Missouri River. .

Although homesteaders came into the Arkansas River Valley throughout the 1870s and filed claims on waterfront lands, the cattle industry grew much more rapidly. During the first decades of the twentieth century, many old-time Colorado cattlemen would look back on the 1870s as the golden era of the open range cattle industry in old Bent County.

The Arkansas Valley Land and Cattle Company was a corporate ranching operation that took advantage of the free open range. It had its beginnings in 1871, when Hiram S. Holly drove 1,300 head of cattle from Texas and settled in eastern Colorado. He established Holly’s Ranch (later the SS Ranch) in what is now the town of Holly. By 1881, Holly had a herd of 15,000 cattle. In 1883, Holly and his partners sold out to an

English corporation that operated under the name of the Arkansas Valley Land and Cattle Company. The deed included approximately “seven hundred thousand acres of public land belonging to the government of the United States, lying on the north and south sides of the Arkansas River and being a portion of the land enclosed by said first parties by a wire fence and used by them as a cattle range.” Under the new management the ranch had at its peak about 35,000 cattle, and expanded from the 20,000 acres Holly had fenced to more than 600,000 acres on the north side of the Arkansas (the company also had extensive acreage on the south side of the Arkansas). Eventually the Arkansas Valley Land and Cattle Company’s fenced range grew to over one million acres. Kiowa County pioneer and newsman C. Frost Liggett described the SS Ranch fence line in 1885:

SS Ranch fence started at Trail City [north of the Arkansas at the Colorado-Kansas border], running in a northerly direction on the east side of Horse Creek, and bearing a little westward, striking and crossing Big Sandy Creek a few miles south of Chivington battlegrounds, where it turned westward several miles thence running south striking the Arkansas river just east of where Lamar is now located and thence east down the river to place of beginning.

Liggett reported that it took a horseman two days to ride around the perimeter of the ranch. The company built a two room house for cowboys in the extreme northwest corner of the SS Ranch property; the house later became a line camp for the Porter A. Thompson Ranch after the SS Ranch broke up in the wake of the Homestead Act. Bill Dawson’s grandfather worked on the ranch when it belonged to the English syndicate, and lived in the two room house when it became a line camp for the Thompson Ranch. Its foundations are still visible and are within the Sand Creek Massacre site boundaries.

With the advent of the large cattle syndicates, the number of cattle in Bent County continued to increase into the 1880s. By 1885, the county assessed stock growers on a

total of 199,462 cattle. But the type of land grab as perpetrated by the large corporations could not last. In 1885, amidst increasing complaints from settlers and small stock growers over the illegal fencing of large tracts of public lands, President Grover Cleveland ordered all private fences removed from the public domain. This order, the overstocking of land, the ensuing harsh winters of 1885 to 1887 and 1892 to 1893, and decreased beef prices from 1889 to 1894, all led to the decline of the open range cattle industry in eastern Colorado. By 1900, herds numbering more than 1,000 head were rare. Large cattle herds, however, continued to be trailed through southeastern Colorado into the 1890s. These herds were typically from Texas and New Mexico on their way to Wyoming, Montana, and the Dakotas, such as the 126,951 head of cattle that came through the Trail City checkpoint during a twelve day period in June, 1886. The last trail herd may have been in 1907, when G. F. Creghe of Lamar brought in a herd of 21,000 from New Mexico to Big Sandy Creek near Chivington.

The heyday of the major cattle syndicates was over, but cattle-raising continued as the open range industry evolved into stock farming, in which smaller stock growers either produced or bought enough feed to see their cattle through the winter. Then, as fee simple land ownership increased towards the end of the nineteenth century, farmers and stock growers began to fence in water sources, meadows, and dry farms. They also enclosed their herds for protection, winter feeding, breeding, and branding. Overgrazing then became a recurrent problem, for although the cattle herds were considerably smaller, they were now confined to smaller pastures. In addition, the many fence lines also meant less access to public grazing lands.

In the land surrounding the Sand Creek Massacre site, stock growing continued into the twentieth century, although many homesteaders also farmed. A. J. Ingram, who held a claim next to Big Sandy Creek (the headgates of the Brandon Canal were partially on his property), grew melons as well as cattle on his property. He did not have as many cattle as Charles William Sweitzer, who had a 10,000 acre ranch on Rush Creek. The T Ranch was located approximately 15 miles northeast of Eads, and according to Sweitzer's daughter, their cattle also roamed on open grazing land 10 miles farther east, at the massacre site.

Cattle-raising obviously has a profound impact on grasslands, but ecologists differ over whether or not that impact is negative. Some believe that although cattle and bison are both large herbivores that share genetic material and grazing niches, they are not necessarily ecologically equivalent. The millions of bison helped maintain grassland *as* grassland that would otherwise become shrubland or woodland. Bison are adapted for year-round survival on the plains, while domesticated cattle need human management and winter feed. While there is diet overlap between bison and cattle, there are also important differences in their diets and grazing habits. Scientists have found that diet overlap is lowest during periods of high food quantity, and that bison tend to eat a higher proportion of grasses and grass-like plants to forbs or woody species. Bison also have larger grazing areas and will return to the same "lawn" to feed on new growths, while cattle tend to feed on smaller patches evenly distributed throughout a pasture.

Some researchers believe these differences are minor. Cattle, like bison, increase spatial heterogeneity (the complexity and variability of a system property, such as biomass, in space) and plant species diversity as long as grazing density is not high. At

Konza Prairie (a tallgrass prairie in Kansas), bison grazing sites did indeed have more annual forbs as well as greater spatial heterogeneity of plant cover when compared to cattle-grazed sites. However, there was no significant difference between cattle- and bison-grazed sites in terms of overall plant species richness. In terms of grassland ecology, then, there may very well be no difference between the plains of millions of bison and the plains of millions of cattle. Since mid-twentieth century, cattle-raising no longer rely entirely on grass, and this has been a major factor in pushing cattle numbers up to the estimated Plains carrying capacity of 17 million livestock. However, environmental historian Geoff Cunfer notes that these ranchers actually still *conform* to the ecological limits of their environment because the limiting factor has always been water, which formerly determined the amount of grass available and now determined the amount of feed that can be grown. If Cunfer is right, cattle are not “ecological anomalies” on the plains, but are a natural successor to bison as *the* large herbivore in modern rangeland management. Thus, in a given community, biological or behavioral differences between bison and cattle do not matter nearly as much as stocking intensity and duration

FARMING AND IRRIGATION

When the fences on public lands came down in the mid-1880s, more settlers came into southeastern Colorado and filed so many claims under homestead and pre-emption laws that good rangelands became scarce. Expansionists had done a good job of convincing vast numbers of homesteaders that the plains were no more a desert than any other land east of the Missouri. And the settlers hoped for all that the land *could* be, and

completely misunderstood what it actually was: a dry land defined by water – or rather, the lack of water. Well into the twentieth century, agriculturalist H. M. Cottrell of the Colorado Experiment Station shook his head over the homesteaders' wild optimism:

Dry land farming is a continual fight against relentless, unfavorable conditions They [the settlers] started in an arid climate, penniless, without any knowledge of the methods needed, and with seed, feed and family supplies to be purchased for from six months to two years before any revenue could be expected

Bev Robertson's family should have heeded the warning when they settled west of Eads:

Since 1915 was one of the best years in my memory, we were sure we had reached the promised land. Our last rain of 1915 fell in early August and our first rain in 1916 also fell in August, so we weren't so sure.

This naïve – perhaps even willful -- misjudgment of the land was to have disastrous human and environmental consequences, and the costs continue today.

The government opened the defunct Cheyenne-Arapaho reservation to Anglo-American settlement in 1867, but homesteaders did not file the first claims until the late 1880s. In 1887, the *La Junta Tribune* reported on farmers' cautious optimism following three seasons of successful wheat crops, and there was talk that perhaps the rain had indeed followed the plow during that year of good moisture. Then a dry spell set in. There were no rain gauging stations in Kiowa County in 1890, but the available data for Kit Carson showed an annual average of 6.82 inches, while the station at Fort Lyon reported 11.07 inches. In the *Report on Agriculture by Irrigation in the Western Part of the United States at the Eleventh Census: 1890*, Frederic Newell commented on the difficult conditions faced by dryfarmers in Kiowa County:

[T]he annual precipitation [is not] sufficient to erode well defined drainage systems. The county was settled about

1887, and fair crops were raised for 1 or 2 years. There were, however, so many losses from drought in 1889 and 1890 that many of the farmers moved to other parts of the state.

C. Frost Liggett's reminiscences of Kiowa County pioneers also shed light on homesteading near the massacre site. William Ridgeley's claim was on "good sandy land, and water was obtained at about 10 to 12 feet deep He dug a well, planted a little garden as the seasons came around." Apparently an indifferent farmer, Ridgeley nevertheless managed to prove his claim in 1893. Charles Wilmeth settled in what became Water Valley, where he "envisioned a city built up upon his claim on the line of the contemplated railroad line on the Missouri-Pacific. And he had already named the new town New Chicago." New Chicago was not to be, but Wilmeth continued to live on his homestead. Water Valley was the only town ever established within the Sand Creek Massacre site boundaries, and though short-lived, it lasted long enough for John Fluke to build a mercantile store in town.

To make agriculture a viable concern on the plains, then, the farmers needed irrigation -- and Kiowa County as yet did not have any. A 1906 map of Colorado shows a thick band of irrigated agricultural lands along the length of the Arkansas River, with a small extension up Big Sandy Creek to approximately 10 miles south of Chivington. Much of this irrigation represented the development of large, mutual stockholding irrigation companies that grew between 1870 and 1900. Prior to about 1880, farming was secondary to stock raising, but farmers did grow some wheat, oats, and various garden vegetables on acres watered by fairly primitive, privately owned ditches. By the end of the 1880s, these ditches were overtaken by a vast network of corporate canals that ran from a few miles to over a hundred miles.

The Fort Lyon Canal Company was one irrigation company that grew to cover 90,000 acres between La Junta and Big Sandy Creek. The origin of the canal was an ambitious enlargement of the old Cheyenne-Arapaho reservation ditch that was originally dug by the Bureau of Indian Affairs in 1864. In 1888, farmers had a successful alfalfa crop, and hopes were high for irrigation projects in general. In addition to alfalfa, irrigation supported the increasingly important commercial crops of melons, onions, fruits, and later, sugar beets. The problem with these large canals was that the developers did not have adequate water rights to supply the projected demand. With allocation based on the rule of prior appropriation, water became – and remains today -- a commodity, its value and use disengaged from its role in the environment of the plains.

Despite ecological problems introduced by irrigation – increased salinity and sedimentation, decreased river flow variability and volume, and decreased water flow downstream – the business of water could be lucrative, and speculators began irrigation projects in areas with much less stable water sources. Sometime between 1908 and 1910, the Chivington Irrigation Company constructed the Brandon Canal, which transported water from the Big Sandy Creek for 20 miles southeast to Brandon Lake (Chivington Reservoir No. 4), just south of Brandon. The headgates of the canal are located within the Sand Creek Massacre site boundaries. The company had intended the Brandon Canal system to irrigate 20,000 acres, but the project appears to have been poorly planned and executed. The canal surveyors and engineers did not account for sudden deluges, which if not common, were not unknown in Big Sandy Creek. C. Frost Liggett remembered a flash flood that roared down the creek one sunny day sometime before the construction of the Brandon Canal:

We heard a strange rumbling noise, and looking up the stream we saw a wall of water rolling along, and had hardly time to get the team and wagon out of the creek bed before they would have been engulfed in the raging stream, which soon spread over the banks.

After a series of dam breaches over the years, floodwaters finally destroyed the canal system, and the community abandoned it in 1918. According to a 1945 report on ground water irrigation in the Big Sandy Creek Valley, Brandon Canal failed because of unsuitable soil and topography, improper land preparation, inadequate water supply, poor equipment, and the collapse of farm prices. Today, the remnants of the headgates and earthworks remain visible from land and air.

The Brandon Canal was not entirely unsuccessful during its lifetime. One could question the wisdom of planting water-loving crops (such as melons) in a dry land, but nevertheless some farmers did so – and quite successfully -- with the help of precious water provided by the irrigation project. Even though the Brandon Canal failed, some farmers were able to sustain their lands by digging wells pumped by wind power. The D. V. Burrell Seed Growers Company of Rocky Ford (still in business after 105 years) started a seed farm 2 miles northwest of Brandon in 1915. By 1918, the 480 acre farm had several wells and four irrigation pumps powered by ten windmills, and grew Irish potatoes, corn, onions, pinto beans, melons, cucumbers, and zinnias. Smaller farms made do with rainwater cisterns and small wells, but water was never a sure thing. The J. O. Walker family settled 17 miles southwest of Eads in 1910, and daughter Helen remembered her father digging multiple test holes and a well on the property, but never finding water. The family hauled water from a neighbor's land several miles to the south

and stored it in a cistern. Sadly, “there wasn’t ever any [water] to be wasted on mud pies.”

Throughout the twentieth century, the general area of the massacre site has been in continuous use for farming and ranching. L.C. (Claude) Bowen settled north of the site in 1948, and together with his son Charles B. (Buster) Bowen -- who bought the adjacent ranch to the south -- raised Hereford bulls on his property. The Bowens dug stock wells and ponds, planted a variety of trees in a blowout section (wind-blown depressions in loose soil or sand) and reseeded the land with sandlove, blue grama, big and little bluestem, buffalo grass, and sideoats grama. In addition, they also had a dryfarm along Big Sandy Creek that produced 1,500 bales of hay a year. Part of the Bowen property now occupies the northwest corner of the Sand Creek Massacre site boundary. Bill Dawson bought what became the Dawson Ranch in 1964; he did not farm, but kept up to 150 cows and calves. At the time Dawson bought the land, cultivated fields surrounded his property, and there was alfalfa where he later built a landing strip. Elsewhere on the property, he reseeded bare patches with native grass. Today, most of the private lands within the authorized boundary are pastures except for two sections in the southeast that have dryfarms. Reminders of the area’s agricultural heritage are strewn across the landscape: the foundation of the line shack from the SS Ranch days, fence lines, wells, windmills, dirt access roads, and ranch buildings.

DROUGHT

For a land already short on water, droughts can be devastating. When settlers first started farming the land west of the 100th meridian in the 1880s, they had enough years of

good rainfall that there were no compelling reasons to suppose rain did *not* follow plow. However, in 1890, and again in 1893 and 1894, southeastern Colorado (and western Kansas) suffered through severe droughts. Decades later, C. Frost Liggett remembered a sandstorm in the 1890s – he called it the “Big Blow” -- that frosted and drilled holes into the windows of a neighbor’s house located on the Big Sandy bottom.

The Great Plains are a climatic transition zone where extremes of weather conditions can cycle rapidly and where most North American droughts occur. Southeastern Colorado receives a mean average of 10 to 14 inches of rain a year, but in any given year and location, precipitation fluctuates widely. Since 1890, Colorado has had six dry periods of varying duration interspersed with wet periods. The longest dry periods were in 1893-1905 and 1931-1941, and there was also an extremely dry period in 1951-1956 during which some areas suffered worse conditions than in the 1930s, due in part to larger tracts of cultivated land broken with mechanized farm equipment during the intervening wet years. Wind was, and is, a constant on the plains of southeast Colorado, but was especially problematic during the drought years. Settlers called the 1930s the “dirty thirties,” and the 1950s the “sifty fifties” – and those two terms conjure up images of the immense dust storms that swept over the plains, killing vegetation, blowing away topsoil, creating sand dunes. In the Sand Creek area, residents remembered even the native grassland – or what was left of it that was not broken sod -- drying up and blowing away during the dust storms of the 1930s. Young Velda Downs tied her name and address to a tumbleweed and later received a reply from someone in Guymon, Oklahoma. During the “sifty fifties,” Buster Bowen recalled fences in the north fields buried under blown dirt; he later built the new fences on top of the old.

Since 1965, Colorado has continued to have wet and dry cycles. After a particularly dry year in 1981, the state government drew up the “Colorado Drought

Mitigation and Response Plan” -- after which the state entered its second longest recorded wet period (1982-1999). In southeastern Colorado, the 1990s constituted the wettest decade on record, but this was followed by another drought during the first half of the 2000s.

FIRE

On 27 January 1865, General Robert B. Mitchell ordered an immense burning of the plains in an effort to drive militant Cheyennes and Arapahos out of the Platte River Valley. “I will give them ten thousand square miles of prairie-fire,” he vowed. And he did. At sunset, soldiers watched the 300-mile simultaneous firing from Fort Kearney to Denver. Three days later, fanned by a northwest wind, the fire had spread along the Arkansas River and as far south as sections of the Texas Panhandle.

Fires are not unusual on the plains, and during late summer and early fall, lightning strikes start many fires. Historically, however, humans have been responsible for most grassland fires. To Anglo-American settlers, native people did not appear to have altered the landscape at all; indeed, it is part of the persistent mythology of the West that white pioneers entered and tamed virgin wilderness. But the Indians had always managed their environment, and fire was a technology they used frequently and to great effect. Native people burned parts of their ecosystem to create greater biodiversity and to increase the “edge effect,” for many of the foods important in hunting and gathering – game birds, berries, seeds, and grains – appeared at the burned edges between forest and grassland. The Indians burned seasonally -- in the late spring to encourage new growth, or in late summer and early fall (in drier areas) to promote main growth during the

winter. In fact, the tallgrass prairies on the eastern margins of the Great Plains relied on fire to remain grasslands, for fire killed trees and cleared away dead vegetation that impeded new grass shoots. As historian Stephen Pyne explains, grasslands could be thought of as a series of fire regimes: “So extensive were the cumulative effects of these modifications that it may be said that the general consequence of the Indian occupation of the New World was to replace forested land with grassland or savannah.”

Combustion, of course, had other uses. Just as General Mitchell used fire as a military tactic, so too did native tribes. Plains people used fire for many other reasons, and among the most prominent were fires set for hunting. Fires greened up the grasslands, and thus could be used to entice bison to new grazing grounds. Or, fires could be used to force bison to particular locations for the kill. The natives also used fire to communicate (signal fires), to deprive enemies of hiding places, to clear travel corridors, and to fireproof village perimeters.

In contrast to the Indians, Anglo-American pioneers used fire to create a uniform environment suitable for permanent settlements, and these settlements in effect returned grasslands to forests. On the plains, grassland conversion mainly took the form of domestic grains and livestock replacing wild grasses and animals. Out on the prairie margins, however, as settlers suppressed ancient fire regimes, reforestation became more apparent as trees grew where they had not grown before. Even in places where natural reforestation did not occur, native grasses disappeared as a result of tree planting, heavy grazing, and invasion (or deliberate transplantation) of exotic plant species.

Fire effects depend on the grassland involved, the season and the weather, and the frequency, intensity, and duration of the fire. In general, fire changes the chemistry and

mineral content of the soil by recycling nutrients from dead plant litter back into the soil. In addition, fire changes the yield, distribution, and diversity of native grasses by creating a vegetative mosaic. Fire, like bison grazing, alters the environment on the landscape scale – and one of the problems with modern range management is that fires historically occurred on a scale no longer present. As General Mitchell’s fire demonstrated, pre-1900 grassland fires covered thousands of hectares with effects that could potentially extend hundreds of miles. Today, grassland fragmentation within a fire-suppressed landscape has reduced the frequency of fire and led to loss of biodiversity. In one study, scientists found that of the 266 plant species catalogued in 54 sites in the 1940s and 1950s, 228 were still present in the late 1980s. In small prairie reserves, managers use fire to suppress exotic and woody plant invasion, but these frequent fires reduce biodiversity even more in comparison to infrequently fired grasslands. Thus, one of the most important problems in ecosystem management remains how to reproduce “natural” fires in fragmented landscapes. With the settling of the West, fire suppression and management schemes have permanently changed the vegetation composition and ecology in grassland communities. No doubt they have also done so at Sand Creek over the years. Most recently in June 2006, lightning ignited a 150 acre fire on the Bowen property near the western boundary of the historic site; the fire was of course quickly suppressed.

SAND CREEK TODAY

“This land comes back It’s dry now in 1976, but it will rain and the land will produce again for it has in the past.” Words of experience and optimism from a

long-time Kiowa County resident, looking back at a lifetime spent on the plains. But what does the land come back as?

At Sand Creek, the land is the silent witness to all the natural and man-made events that have occurred over the centuries. Today, at least seventy-five percent of the Sand Creek Massacre area is made up of ecological sites ranging from sands to deep sands. The soils -- sandy loams and loamy sands -- are especially susceptible to wind and water erosion when vegetative cover is inadequate. In the historic climax plant community, the dominant grasses were tallgrasses such as sand bluestem, prairie sandreed, switchgrass, and yellow Indiangrass. However, there have been many disturbances from continuous grazing, changes in water availability, fires, cultivation, and disuse. Thus while these areas are potentially tallgrass communities, they currently do not have tallgrasses to the extent predicted. In general, sagebrush species have increased, evidence of the dry environment at the Sand Creek site. The other twenty percent or so of Sand Creek is made up of shortgrass, loamy plains ecological sites. The historic plant community was the result of grazing by large herbivores such as the bison, and the dominant shortgrasses were western wheatgrass, blue grama, galleta, and fourwing saltbush. This area has also had extensive disturbances from grazing, seeding, and cultivation.

The most prominent difference between the Sand Creek site in 1864 and today is the presence of numerous groves of cottonwoods along the creek banks. The dearth of trees in the nineteenth century may have been due to prairie fires, grazing and trampling by bison and horses, and floods. In addition, native people also used the trees for firewood and emergency forage for their horses. Since homesteading began, however,

wildfires have been routinely suppressed, the bison and horse herds are gone (although cattle remain), and water availability has been altered by agriculture use, ponds, and wells.

Willows and cottonwoods are common tree species in riparian areas. At the massacre site, pollen records show a prominent absence of willows (*Salix*) in the past, and they continue to be absent today. One reason may be that willows prefer continuously wet and cool environments, and the Sand Creek site was too dry to support this species. Cottonwoods, however, occur naturally in riparian zones in semi-arid regions, and their entire life cycle is tied to water originating from stream flow. Cottonwood seedlings need moist, bare patches that are protected from strong disturbances. While floods can destroy saplings and trees, they also produce flood depositions that form appropriate germinating sites. This process produces small, linear, same-aged groves. The mature trees grow close to surface ground above the creek bed, and take their water from groundwater replenished from stream sources.

At the Sand Creek Massacre site, flood depositions may have been responsible for many of the cottonwoods now standing. In a tree-dating study for the National Park Service, researchers identified same-aged tree stands for the years 1865-1885, 1908-1920, and 1948-1959 (with smaller peaks in 1949 and 1954). The analyses of available climate and precipitation data from 1893-2005 indicate that there were major floods in 1908, 1949, 1954, and 1965. The 1908, 1949, and 1954 floods correspond well to their respective cottonwood stands, and though there is no corresponding 1965 grove, comparisons with other riparian areas suggest that this is not an unusual occurrence.

Geomorphology studies indicate that the landforms and topography of the general area – including Big Sandy Creek – have remained essentially the same. However, whereas the banks are now fairly flat or gently sloping, eyewitness accounts from 1864 describe steep embankments farther north of the village that were as tall as 15 to 20 feet. According to landowners Chuck and Sheri Bowen, long-time residents remember that before the dust storms of the 1930s, the banks were steeper, especially in sections on Bowen land, and that the storms swept off the tops of the banks while adding dirt to the creek bottom. After the dust storms of the 1950s, Buster Bowen believes the creek bed may have accumulated another foot of sand. In addition to wind erosion and deposition, water diversions earlier in the century from the Brandon Canal as well as the Ray Irrigation Ditch (which ran from Section 10 to Section 14) may have contributed to changes in the embankment. Finally, stock grazing and crop tilling are also possible factors in the altered appearance of the banks.

Although there is no longer any irrigation within the authorized Sand Creek NHS boundaries, property owners still use shallow wells for domestic purposes and for watering stock. The water source for these wells is a surface aquifer in the thin layer of alluvium that overlies much of the Sand Creek valley. The aquifer is replenished only by rainwater and floodwater infiltration. According to a USGS ground water study conducted in 1967, the various irrigation wells then present in the valley had not permanently lowered the water table, although the increasing numbers of deep-rooted plants such as cottonwoods and saltcedars may potentially increase water use. Currently, the groundwater as well as the Big Sandy Creek water itself does not meet drinking water standards. While water quality can vary throughout the year depending on rainfall and

flow, and the water quality may also have changed in the last 150 years, modern chemical analyses would seem to support native oral accounts that the people had separate fresh water source.

Many Cheyenne and Arapaho descendants believe the fresh water source of their ancestors is the large perennial spring that flows from outside the massacre site boundary southeast into Big Sandy Creek. The Kern spring water source consists of both local groundwater as well as surface and groundwater flow from as far as 5 miles northeast. This historic spring has been in continual use for 150 years and more, and not just within the massacre site boundaries. Farther upstream, property owners have tapped into the groundwater as well as other smaller traces that drain into the spring. Within the site boundaries, the spring and the drainage area between its confluence with Sand Creek south to County Road W is now a wetland habitat. This area, like other areas around the massacre site, has been much influenced by grazing, farming, erosion, and water diversion.

CONCLUSION

Landscapes reflect past and present social, political, economic, and cultural values; they are thus records of human activities, “good” and “bad.” The Sand Creek Massacre site is a contested space where the stories of natives, ranchers, farmers, and now, the National Park Service, run in series and in parallel. The challenge for the National Park Service is not so much *preserving* the site as making the site environmentally, culturally, and historically meaningful for visitors. Some basic (and

thorny) management issues, then, are defining exactly what is being conserved, what is being removed, and what will be added.

Ethnographic landscapes in particular are challenging because they involve culture-specific ways of looking at and using the environment. A prominent example is the clash between Native Americans and whites over sacred environments. A site such as Devil's Tower (in northeastern Wyoming) is a sacred place of worship for many tribes, but it is also a tourist and recreational area for non-Indians. It is clearly visible as a unique, natural resource, yet the cultural meanings and practices associated with it by a minority people are not tangible or readily understood. How should cultural landscapes such as this be identified, interpreted and understood, accessed, and preserved? What is clear is that whatever the National Park Service chooses to preserve or return to the historic range of conditions, the Sand Creek Massacre site was, and is, a manipulated environment. In this landscape, the emphasis on particular features of the land, associated with particular parts of the cultural heritage, during a specific period of time, means the loss of some other pieces of the shared history.

In 1989, Kiowa County historian Ruthanna Jacobs summed up some changes in the country since Zebulon Pike passed through in 1806:

[T]he buffalo are gone; the wild horse bands have disappeared. The deer and the antelope have returned; the rattlesnakes and prairie dogs resisted all efforts to eradicate them The last gray wolf bounties were paid in the early 1900s when the wolves were gone, coyotes were hunted extensively [then] the country was overrun with rabbits.

To the above list we can also add: Indians went, Anglo-Americans and their agricultural endeavors came and stayed, and through it all, there were fires, floods, droughts, and

even locusts. As Jacobs' litany of species shows, a single change is never a singular event, and Sand Creek Massacre site today is an ongoing process formed by complex interactions between humans and their environment. Humans have a need to have tangible evidence of memories, for memories are intrinsic to identity. In the holistic view of nature, man is indeed part of the environment, but he is also set apart by his ability to shape his world, both physically and mentally. And thus we have memorials – and histories.

There are multiple stories of Sand Creek, depending on who is doing the telling. There is the familiar narrative of a fairly linear march of progress, its emphasis on settlers who transformed their environment and crafted a landscape laden with all the symbols of civilization: rectangular property lines, fences, houses and buildings, farms, pastures, gardens, trees. Look closer, however, and there are alternative stories, stories not just of progression but also of regression – of land broken and plowed, settled, ruined, and abandoned. The story of Sand Creek is a story of man *in* his environment, neither a conqueror nor an interloper, but part of the ongoing process of “adjustment and readjustment from one stage of temporary equilibrium to another.”

In *One Vast Winter Count*, historian Colin Calloway pointed out that who the native people think they are and what they most care about have everything to do with the country and what happened there. In the “big picture” American historical narrative, the Sand Creek Massacre site became just another piece of land, a part of the story of Anglo-American settlers and their dreams of owning their own pieces of the empire. It is not surprising, then, that over the years, Anglo-Americans somehow “lost” the massacre site. The Cheyenne and Arapaho, however, believe they have always known where it was.

For them, Sand Creek represents not just a loss of physical control of resources and land – but also, in a sense, loss of identity. The people still talk about the massacre as though it had just occurred – not only to the ancestors, but also to themselves.

Since the day it happened, the Sand Creek Massacre has been permanently embedded in Cheyenne and Arapaho culture; whatever changes may have occurred at its physical location, its spirit has become an irrefutable part of the tribes' identities. The land is sacred not just because ancestors died there; for some descendents, it *is* the ancestors – hence Jesse Howling Water beginning his oral history with, “Sand Creek was my great-great-grandpa.” For the descendents, Sand Creek is a place of grief and tragedy – yet it can also be a place of healing, a chance to commune with the ancestors in happier times. Robert Toahty recounted his experiences at Sand Creek in the 1990s:

[Y]ou can go there at any time of day or night and if you close your mind to everything else you can feel the children, where they're congregating and laughing and having fun. The old ladies mostly congregate in the shade. The young warriors congregate in the rocks Hopefully if they want to go on I can give them some prayers.

“Nothing lives long except the earth and the mountains,” Chief White Antelope sang his death song as bullets tore through his body. White Antelope was wrong about nothing lives long, though; his descendents have proven that history does not end, and a place can hold memories and spirits that do not die.

BIBLIOGRAPHY

- Abert, James William. *Expedition to the Southwest: An 1845 Reconnaissance of Colorado, New Mexico, Texas and Oklahoma*. Lincoln and London: University of Nebraska Press, 1999.
- _____. *Western America in 1846-1847: The Original Travel Diary of Lieutenant J. W. Abert, who mapped New Mexico for the United States Army*. Edited by John Galvin. San Francisco: John Howell Books, 1966.
- Anderson, David L., John G. Lesh, and Donald W. Wickman. *Soil Survey of Kiowa County, Colorado*. United States Department of Agriculture: Soil Conservation Service, in cooperation with Colorado Agricultural Experiment Station, 1981.
- Aughey, Samuel and C. D. Wilber. *Agriculture Beyond the 100th Meridian: A Review of the U. S. Public Land Commission*. Lincoln, NE: Journal Company, State Printers, 1880.
- Aughey, Samuel. *Sketches of the Physical Geography and Geology of Nebraska*. Omaha, NE: Daily Republican Book and Job Office, 1880.
- Beck, Warren A. and Ynez D. Haase. *Historical Atlas of the American West*. Norman, NE: University of Oklahoma Press, 1989.
- Bent, George, to Joseph B. Thoburn, 3 March 1914. Thoburn Collection, Oklahoma Historical Society, Oklahoma City, Oklahoma.
- Bock, Carl E. "Birds and Bovines: Effects of Livestock Grazing on Birds in the West." In *Welfare Ranching: The Subsidized Destruction of the American West*, eds. George Wuerthner and Mollie Yoneko Matteson. Washington, D.C.: Island Press, 2002. Chapter on-line. Available from http://www.publiclandsranching.org/htmlres/PDF/wr_BIRDS_BOVINES.pdf. Accessed 2 January, 2007
- Boone, A. G., to Governor Gilpin, 1 June 1861. Letters Received by the Office of Indian Affairs, 1824-81. Microfilm. National Archives and Records Administration, Denver, CO.
- Bowen, Chuck, and Sheri Bowen. "The Search for the Sand Creek Massacre," 1999. Unpublished report, photocopy. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.
- Brosnan, Kathleen A. *Uniting Mountain and Plain: Cities, Law, and Environmental Change Along the Front Range*. Albuquerque, NM: University of New Mexico Press,

2002.

- Calloway, Colin G. *One Vast Winter Count: The Native American West Before Lewis and Clark*. Lincoln and London: University of Nebraska Press, 2003.
- Coffin, Donald L. *Geology and Ground-Water Resources of the Big Sandy Creek Valley, Lincoln, Cheyenne, and Kiowa Counties, Colorado*. Geological Survey Water-Supply Paper 1843. Washington, D.C.: Government Printing Office, 1967.
- Coffin, Morse H. *The Battle of Sand Creek*. Edited by Alan W. Farley. Waco, TX: W. M. Morrison, 1965.
- Carey, R. G., ed. *A Collection of Documents Concerning the Battle of Sand Creek*. Denver: University of Denver [Colorado Seminary], 1958.
- Connelley, William E. "Chalkley M. Beeson." In *A Standard History of Kansas and Kansas*, ed. William E. Connelley. Chicago: Lewis Publishing Company, 1918. Book on-line. Available from <http://skyways.lib.ks.us/genweb/archives/1918ks/biob/beesoncm.html>. Accessed 1 August 2006.
- Cook, Edward R., Connie A. Woodhouse, C. Mark Eakin, David M. Meko, and David W. Stahle. "Long-Term Aridity Changes in the Western United States." *Science* 306, no. 5698 (5 Nov 2004): 1015-1018.
- Coronado, Francisco Vásquez de. "Coronado's Report to the King of Spain, Sent from Tiquex on October 20, 1541." Letter on-line. Available from www.pbs.org/weta/thewest/resources/archives/one/corona9.htm. Accessed 21 August 2008.
- Cottrell, H.M. *Dry Land Farming in Eastern Colorado*. Colorado Agricultural Experiment Station Bulletin 145. Fort Collins, CO: Agricultural Experiment Station of the Colorado Agricultural College, 1909.
- Cunfer, Geoff. *On the Great Plains: Agriculture and Environment*. College Station, TX: Texas A & M University Press, 2005.
- Custer, George Armstrong. *My Life on the Plains, or Personal Experiences with Indians*. Norman, OK, and London: University of Oklahoma Press, 1962.
- Daily, John Lewis. *Diary* (microfilm). Western History Department, Denver Public Library, Denver, Colorado.
- Danz, Harold P. *Of Bison and Man: From the Annals of a Bison Yesterday to a Refreshing Outcome From Human Involvement with America's Most Valiant of Beasts*. Niwot, CO: University Press of Colorado, 1997.

- Darton, N. H. *Geology and Underground Waters of the Arkansas Valley in Eastern Colorado*. Geological Survey Paper 52. Washington, D.C.: Government Printing Office, 1906.
- Dawson, Bill. Interview by Jacqui Ainlay-Conley and Alexa Roberts, 18 April 2005. Summary, photocopy. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.
- deMenocal, Peter B. "Cultural Responses to Climate Change During the Late Holocene." *SCIENCE* 292 (27 April 2001): 667-673. Journal on-line. Available from <http://research.yale.edu/leilan/demenocal2001.pdf>. Accessed 10 January 2005.
- Dixon, Olive King. *Life of "Billy" Dixon: Plainsman, Scout and Pioneer*. 1927. Reprint, Austin, TX: State House Press, 1987.
- Dobak, William A. "The Army and the Buffalo: A Demure. A Response to David D. Smits's 'The Frontier Army and the Destruction of the Buffalo: 1865-1883.'" *Western Historical Quarterly* 26 (Summer 1995): 197-202.
- Emmons, David. "The Influence of Ideology on Changing Environmental Images: the Case of Six Gazeteers." In *Images of the Plains: The Role of Human Nature in Settlement*, eds. Brian W. Blouet, Merlin P. Lawson. Lincoln, NE: University of Nebraska Press, 1975.
- Ewers, John C. *The Horse in Blackfoot Indian Culture, With Comparative Material From Other Western Tribes*. Smithsonian Institution Bureau of American Ethnology Bulletin 159. 1955. Reprint, Washington, D.C.: Smithsonian Institution Press, 1969.
- Fitch, Julian R. "Lieut. Fitch's Report on the Smoky Hill Route." In *Indian War of 1864: Being a Fragment of the Early History of Kansas, Nebraska, Colorado, and Wyoming*, by Eugene F. Ware, 583-592. Topeka, KS: Crane & Company, 1911.
- Flores, Dan. "Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850." *Journal of American History* 78, no. 2 (Sept 91): 465-485.
- _____. *Horizontal Yellow: Nature and History in the Near Southwest*. Albuquerque: The University of New Mexico Press, 1999.
- _____. *The Natural West: Environmental History in the Great Plains and Rocky Mountains*. Norman: University of Oklahoma Press, 2001.
- Fremont, John C. *A Report of the Exploring Expedition to the Rocky Mountains in the Year 1842 and to Oregon and North California in the Years 1843-44*. 1845. Reprint, Washington, D.C.: Smithsonian Institution, 1988.

- Geist, Valerius. *Buffalo Nation: History and Legend of the North American Bison*. Stillwater, MN: Voyageur Press, Inc., 1996.
- _____. "Phantom Subspecies: The Wood Bison *Bison bison* "athabascaae" Rhoads 1897 Is Not a Valid Taxon, but an Ecotype," *Arctic* 44, no. 4 (Dec 1991): 283-300.
- Greene, Jerome A. and Douglas D. Scott. *Finding Sand Creek: History, Archeology, and the 1864 Massacre Site*. Norman, OK: University of Oklahoma Press, 2004.
- Hamalainen, Pekka. "The Rise and Fall of Plains Indian Horse Cultures." *The Journal of American History* 90, issue 3 (December 2003): 833-862.
- Hardesty, Donald L. "Ethnographic Landscapes: Transforming Nature into Culture." In *Preserving Cultural Landscapes in America*, eds. Arnold R. Alanen and Robert Z. Melnick, 169-185. Baltimore and London: Johns Hopkins University Press, 2000.
- Hoig, Stan. *The Sand Creek Massacre*. Norman and London: University of Oklahoma Press, 1961.
- Holmes, Amy M. and Michael McFaul, "Geomorphological and Geoarchaeological Assessment: Possible Sand Creek Massacre Site, Dawson Property, Kiowa County, Colorado," 1999. Unpublished report, photocopy. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.
- Howbert, Irving. *Memories of a Lifetime in the Pike's Peak Region*. 1925. Reprint, Glorieta, NM: The Rio Grande Press, Inc., 1970.
- Hyde, George E. *Life of George Bent: Written from His Letters*. Edited by Savoie Lottinville. Norman: University of Oklahoma Press, 1968.
- Intergovernmental Panel on Climate Change (IPCC). "Observed Climate Change and Variability." *Climate Change 2001: The Scientific Basis*. Cambridge: Cambridge University Press for the Intergovernmental Panel on Climate Change, 2001. Book on-line. Available from http://www.grida.no/climate/ipcc_tar/wg1/070.htm. Accessed 7 July 2006.
- Isenberg, Andrew C. *The Destruction of the Bison: An Environmental History, 1750-1920*. Cambridge: Cambridge University Press, 2000.
- Iverson, Peter, ed. *The Plains Indians of the Twentieth Century*. Norman, OK and London: University of Oklahoma Press, 1985.
- Jacobs, Ruthanna, compiler. *Kiowa County, Colorado, Centennial History 1989*. Dallas: Curtis Media Corporation, 1989.

- Johnson, Melvyn V. "Floods of June in the Arkansas River Basin, Colorado, Kansas, and New Mexico." In *Summary of Floods in the United States During 1965*, Geological Survey Water-Supply Paper 1850-E, ed. J. O. Rostvedt, 63-64. Washington D.C.: Government Printing Office, 1970.
- Joly, Damien O. and Francois Messier, "The Effect of Bovine Tuberculosis and Brucellosis on Reproduction and Survival of Wood Bison in Wood Buffalo National Park." *Journal of Animal Ecology* 74 (2005): 543-551.
- Kappler, Charles J., ed. *Indian Affairs: Laws and Treaties*. Washington, D.C.: GPO, 1904. Digital images on-line. Available from <http://digital.library.okstate.edu/kappler/Vol2/treaties/Toc.htm>. Accessed 25 April 2006.
- Knapp, Alan K., John M. Blair, John M. Briggs, Scott L. Collins, David C. Hartnett, Loretta C. Johnson, and E. Gene Towne. "Keystone Role of Bison in North American Tallgrass Prairie." *Bioscience* 49, issue 1 (Jan 1999): 39-50.
- Konza Environmental Education Program. "Bison on Konza." On-line. Available from http://climate.konza.ksu.edu/KEEP/sci_adventures/bison/2_konza_bison.htm. Accessed 28 July 2006.
- Langston, Nancy E. "People and Nature: Understanding the Changing Interactions Between People and Ecological Systems." In *Ecology*, ed. Stanley I. Dodson, 25-76. Oxford and New York: Oxford University Press, 1998.
- Lawrence, Elizabeth Atwood. "The Symbolic Role of Animals in the Plains Indian Sun Dance." *Society & Animal Journal of Human-Animal Studies* 1, no. 1 (1993). Journal on-line. Available from www.psyeta.org/sa/sa1.1/lawrence.html. Accessed 21 July 2006.
- Leach, Mark K. and Thomas J. Givnish. "Ecological Determinants of Species Loss in Remnant Prairies." *Science* 273, no. 5281 (13 September 1996): 1555-1558.
- Leigh, Kathy. "A Brief History of Holly." Holly Historical Society. On-line. Available from <http://www.geocities.com/Heartland/Ranch/7375/history.html>. Accessed 22 July 2006.
- Libecap, Gary D. and Zeynep Kocabiyik Hansen. "'Rain Follows the Plow' and Dryfarming Doctrine: The Climate Information Problem and Homestead Failure in the Upper Great Plains, 1890-1925." *Journal of Economic History* 62 (1 Mar, 2002): 86-120.

Liberty, Margot. "Cheyenne Primacy: The Tribes' Perspective as Opposed to that of the United States Army; A Possible Alternative to 'The Great Sioux War of 1876.'" November 2006. Article for Friends of the Little Bighorn Battlefield. On-line. Available from www.friendslittlebighorn.com/cheyenneprimacy.htm. Accessed 1 January 2007.

_____, ed. *A Northern Cheyenne Album*. Norman, OK: University of Oklahoma Press, 2006.

Lott, Dale F. *American Bison: A Natural History*. Berkeley and Los Angeles: University of California Press, 2002.

Magoffin, Susan Shelby. *Down the Santa Fe Trail and into Mexico: The Diary of Susan Shelby Magoffin, 1846-47*. Edited by Stella M. Drumm. Lincoln, NE, and London: University of Nebraska Press, 1982.

Malin, James. *The Grassland of North America: Prolegomena to its History*. Gloucester, MA: Peter Smith, 1967.

_____. *History and Ecology: Studies of the Grassland*. Edited by Robert P. Swierenga. Lincoln and London: University of Nebraska Press, 1984.

Martin, Larry. *Potential Groundwater Sources for a Potable Water Supply: Sand Creek Massacre Site, Kiowa County, Colorado*. U.S. Department of the Interior, National Park Service: Water Resources Division, June, 2006. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.

McDonald, Jerry N. *North American Bison: Their Classification and Evolution*. Berkeley and Los Angeles: University of California Press, 1981.

McKee, Thomas B., Nolan J. Doesken, John Kleist, Catherine J. Shrier, and William P. Stanton. "A History of Drought in Colorado: Lessons Learned and What Lies Ahead." *Water in the Balance Report* No. 9, 2nd ed. (Feb, 2000). On-line. Available from <http://ccc.atmos.colostate.edu/pdfs/ahistoryofdrought.pdf>. Accessed 28 July 2006.

Meltzer, David J. "Human Responses to Middle Holocene (Altithermal) Climates on the North American Great Plains." *Quaternary Research* 52 (1999): 404-416. On-line. Available from http://www.smu.edu/ANTHRO/faculty/dMeltzer/pdf%20files/QR_1999_Altithermal.pdf#search='altithermal%20period. Accessed 10 January 2005.

Mills, L. Scott, Michael E. Soule, and Daniel F. Doak. "The Keystone-Species Concept in Ecology and Conservation.." *BioScience* 43, issue 2 (April 1993): 219-224.

- Moore, John H. *The Cheyenne Nation: A Social and Demographic History*. Lincoln, NE, and London: University of Nebraska Press, 1996.
- _____. *The Cheyenne*. Cambridge, MA, and Oxford: Blackwell Publishers, Inc., 1996.
- Nell, Louis. "Nell's Topographical Map of the State of Colorado, 1906." Denver, Kendrick Book & Stationary Company, 1906. Archives and Special Collections, Morgan Library, Colorado State University, Fort Collins, Colorado.
- Newell, F.H. *Report on Agriculture by Irrigation in the Western Part of the United States at the Eleventh Census: 1890*. United States Department of the Interior, Census Office, Washington D.C.: Government Printing Office, 1894.
- Noon, Kevin, Mike Martin, Joel Wagner, Larry Maring, and Alexa Roberts. *A Preliminary Assessment of Wetland, Riparian, Geomorphology, and Floodplain Conditions at Sand Creek Massacre National Historic Site, Colorado*. U.S. Department of the Interior, National Park Service: Water Resources Division, June, 2005. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.
- Ojima, Dennis S. and Jill M. Lackett, compilers. *Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change: Central Great Plains*. A Report of the Central Great Plains Regional Assessment Group for the U.S. Global Change Research Program, July 2002. Available from www.nrel.colostate.edu/projects/gpa_report.pdf. Accessed September 2008.
- "The Old Woman of the Spring." In *American Indian Myths and Legends*, ed. Richard Erdoes and Alfonso Ortiz, 26-28. New York: Pantheon Books, 1984.
- Paine, Robert T. "A Note on Trophic Complexity and Community Stability." *The American Naturalist* 103 (1969): 91-93.
- Paulson, R.W., E.B. Chase, R.S. Roberts, and D.W. Moody, compilers. *National Water Summary 1988-89: Hydrologic Events and Floods and Droughts*. Geological Survey Water-Supply Paper 2375. On-line. Available from http://geochange.er.usgs.gov/sw/impacts/hydrology/state_fd/cowater1.html. Accessed 15 September 2006.
- Payne, J. E. *Investigation of the Great Plains: Unirrigated Lands of Eastern Colorado, Seven Years' Study*. Colorado Agricultural Experiment Station Bulletin 77. Fort Collins, CO: Agricultural Experiment Station of the Colorado Agricultural College, 1903.

- _____. *The Plains of Colorado*. Colorado Agricultural Experiment Station Bulletins 87-90. Fort Collins, CO: Agricultural Experiment Station of the Colorado Agricultural College, 1904.
- Pike, Zebulon. *Zebulon Pike's Arkansaw Journal: In Search of the Southern Louisiana Purchase Boundary Line (Interpreted by His Newly Recovered Maps)*. Vol. 1, *Overland to the Pacific*, ed. Stephen Harding Hart and Archer Butler Hulbert. Denver: The Stewart Commission of Colorado College and the Denver Public Library, 1932.
- _____. *Exploratory Travels through the Western Territories of North America: Comprising a Voyage from St. Louis, on the Mississippi, to the Source of that River, and a Journey Through the Interior of Louisiana, and the North-Eastern Provinces of New Spain. Performed in the years 1805, 1806, 1807, by Order of the Government of the United States*. 1811. Reprint, Denver: W. H. Lawrence & Co., 1889.
- Post, Charles C. "The Arkansas Route: Diary of Charles C. Post." In *To the Pike's Peak Gold Fields, 1859*, ed. LeRoy R. Hafen, 19-55. 1922. Reprint, Lincoln, NE, and London: University of Nebraska Press, 2004.
- Powell, Peter J. *Sweet Medicine: The Continuing Role of the Sacred Arrows, the Sun Dance, and the Sacred Buffalo Hat in Northern Cheyenne History*. Norman, OK: University of Oklahoma Press, 1969.
- Prucha, Francis Paul. *Atlas of American Indian Affairs*. Lincoln and London: University of Oklahoma Press, 1990.
- Pyne, Stephen J. *Fire in America: A Cultural History of Wildland and Rural Fire*. Princeton, NJ: Princeton University Press, 1982.
- Roe, Charles E. "The Natural Environment." In *A Richer Heritage: Historic Preservation in the Twenty-first Century*, ed. Robert E. Stipe, 223-251. Chapel Hill and London: University of North Carolina Press, for Historic Preservation Foundation of North Carolina, Inc., 2003.
- Rorabacher, J. Albert. *The American Buffalo in Transition: A Historical and Economic Survey of the Bison in America*. St. Cloud, MN: North Star Press, 1970.
- The Sand Creek Massacre: A Documentary History, with an Introduction by John M. Carroll*. New York: Sol Lewis, 1973.
- Schwartz, Charles C. and James E. Ellis. "Feeding Ecology and the Niche Separation in Some Native and Domestic Ungulates on the Shortgrass Prairie." *Journal of Applied Ecology* 18, no. 2 (August 1981): 343-353.

- Scott, Glenn R. *Historic Trail Map of the Lamar 1° x 2° Quadrangle, Colorado and Kansas*. U.S. Department of the Interior, U.S. Geological Survey, 1995.
- Scott, Michael L., Gregor T. Auble, and Jonathan M. Friedman. "Flood Dependency of Cottonwood Establishment Along the Missouri River, Montana, USA." *Ecological Applications* 7, no. 2 (1997): 677-690. On-line. Available from <http://www.mesc.usgs.gov/products/Publications/2851/2851.pdf>. Accessed 3 August 2006.
- Sellars, Richard West. *Preserving Nature in the National Parks: A History*. New Haven and London: Yale University Press, 1997.
- Sherow, James E. *Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950*. Lawrence, KS: University Press of Kansas, 1990.
- _____. "Workings of the Geodialectic: High Plains Indians and Their Horses in the Region of the Arkansas River Valley, 1800-1870." *Environmental History Review* (Summer 1992): 62-84.
- Sipes, Jr., John, interview conducted for "Tears in the Sand," a documentary film of the Sand Creek Massacre produced by Rocky Mountain PBS. Transcript on-line. Available from <http://www.krma.org/tears/interv2.html>. Accessed 5 April 2006.
- Smits, David D. "The Frontier Army and the Destruction of the Buffalo: 1865-1883." *Western Historical Quarterly* 25 (Autumn 1994): 312-338.
- _____. "More on the Army and the Buffalo: The Author's Reply." *Western Historical Quarterly* 26 (Summer 1995): 203-208.
- Taylor, Bayard. *Colorado: A Summer Trip*. Edited by William W. Savage, Jr. and James H. Lazalier. 1867. Reprint, Niwot, CO: University Press of Colorado, 1989.
- Teal, Roleta D. and Betty Lee Jacobs, compilers. *Kiowa County*. Boulder, CO: Johnson Publishing Co. for Kiowa County Bicentennial Committee, 1976.
- Toomey, III, Rickard S. *The Midwestern U.S. 16,000 Years Ago: Late Pleistocene Extinctions*. Illinois State Museum. On-line. Available from http://www.museum.state.il.us/exhibits/larson/env_change_extinction.html. Accessed 10 January 2005.
- Trimble, Donald E. *The Geological Story of the Great Plains: a nontechnical description of the origin and evolution of the landscape of the Great Plains*. Geological Survey Bulletin 1493. Washington: Government Printing Office, 1980.

- U.S. Congress. Senate. *Report of the Joint Committee on the Conduct of the War, Massacre of the Cheyenne Indians*. 38th Cong., 2nd Session, 1865. 3 vols. S. Rept. 142. Serial 1214.
- U.S. Department of Agriculture. Natural Resources Conservation Services. "Ecological Site Description: MLRA 69: Upper Arkansas Valley Rolling Plains." Electronic Field Office Technical Guide. Available from <http://efotg.nrcs.usda.gov/treemenuFS.aspx>. Accessed 13 June 2006.
- U. S. Department of the Interior. Fish and Wildlife Service. 50 CFR Part 17, RIN 1018-AF35, "Endangered and Threatened Wildlife and Plants: Proposed Threatened Status for Mountain Plover." *Federal Register* 64, no. 30 (Feb. 16, 1999): 7587-7601. On-line. Available from http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1999_register&docid=fr16fe99-26.pdf. Accessed 2 January, 2007.
- _____. General Land Office. "Field Notes for Surveys in Township 17 South, Ranges 45, 46, and 47 West, 1879-1880." Photocopy. Bureau of Land Management, Colorado State Office, Denver, Colorado.
- _____. National Park Service. *Sand Creek Massacre Project, Volume 1: Site Location Study*. Denver: National Park Service, Intermountain Region, 2000.
- _____. National Park Service. *Sand Creek Massacre Project, Vol. 2: Special Resource Study(SRS) and Environmental Assessment (EA)*. Denver: National Park Service, Intermountain Region, 2000.
- University of Kansas Museum of Anthropology. "Kansas City Hopewell." On-line. Available from www.anthro.ku.edu/hopewell/kchopewell.php. Accessed 3 July 2006.
- Utley, Robert M. *The Indian Frontier 1846-1890*. Revised ed. Albuquerque: University of New Mexico Press, 1984.
- Van Hook, Joseph Orlando. "Settlement and Economic Development of the Arkansas Valley from Pueblo to the Colorado-Kansas Line, 1860-1900." Ph.D. dissertation, University of Colorado, 1933.
- Vickery, Peter D., James R. Herkert, Fritz L. Knopf, Janet Ruth, Cherry E. Keller. "Grassland Birds: An Overview of Threats and Recommended Management." On-line. Available from www.birds.cornell.edu/pifcapemay/vickery.htm. Accessed 21 July 2006.
- Ward, Geoffrey C. *The West: An Illustrated History*. Boston: Little, Brown and Company, 1996.

- Ware, Eugene F. *Indian War of 1864: Being a Fragment of the Early History of Kansas, Nebraska, Colorado, and Wyoming*. Topeka, KS: Crane & Company, 1911.
- Wegman-French, Lysa and Christine Whitacre. "Historical Research on the Location of the Sand Creek Massacre Site: Interim Report No. 1," 11 September 1998. Photocopy. National Park Service Intermountain Support Office, Denver, Colorado.
- _____. "Historical Research on the Location of the Sand Creek Massacre Site: Interim Report No. 2," 29 January, 1999. Photocopy. National Park Service Intermountain Support Office, Denver, Colorado.
- _____. "Historical Research on the Location of the Sand Creek Massacre Site: Interim Report No. 3," 27 April 1999. Photocopy. National Park Service Intermountain Support Office, Denver, Colorado.
- Wedel, Waldo R. "Coronado and Quivira." In *Spain and the Plains: Myths and Realities of Spanish Exploration and Settlement on the Great Plains*, eds. Ralph H. Vigil, Frances W. Kaye, John R. Wunder. Niwot, CO: University Press of Colorado, 1994.
- West, Elliott. *The Contested Plains: Indians, Goldseekers and the Rush to Colorado* Lawrence: University Press of Kansas, 1998.
- _____. *The Way to the West: Essays on the Central Plains* (Albuquerque: University of New Mexico Press, 1995),
- White, Lonnie J., ed. *Chronicle of a Congressional Journey: The Doolittle Committee in the Southwest, 1865*. Boulder, CO: Pruett Publishing Company, 1975.
- White, Richard. "The Nationalization of Nature." *Journal of American History* 86, no. 3 (Dec. 1999): 976-986.
- Williams, Gerald W. "References on the American Indian Use of Fire in Ecosystems." On-line. Available from http://www.wildlandfire.com/docs/biblio_indianfire.htm. Accessed 30 July 2006.
- Williams, Scott C., comp. *Colorado History through the News (A Context of the Times): The Indian Wars of 1864 through the Sand Creek Massacre*. Aurora, CO: Pick of Ware Publishing, 1997.
- Willing, George M. "Diary of a Journey to the Pike's Peak Gold Mines in 1859." Edited by Ralph P. Bieber. *The Mississippi Valley Historical Review* 14, no. 3 (Dec 1927): 360-378.
- Woodhouse, Connie A., Jeffrey J. Lukas, and Peter M. Brown. "Drought in the Western Great Plains, 1845-56: Impacts and Implications." *Journal of the American Meteorological Society* 83, no. 10 (October 2002): 1485-1493.

Woodhouse, Connie A. and Jeff Lukas, "Riparian Forest Age Structure and Past Hydroclimatic Variability: Sand Creek Massacre NHS and Bent's Old Fort NHS," March 2006. Progress Report for National Park Service, photocopy. Sand Creek Massacre National Historic Site Project Office, National Park Service, Eads, Colorado.

Worster, Donald. *Nature's Economy: A History of Ecological Ideas*. Cambridge: Cambridge University Press, 1977.

Wright, Jr., H. E. "Vegetational History of the Central Plains." In *Pleistocene and Recent Environments of the Central Great Plains*, eds. Wakefield Dort, Jr. and J. Knox Jones, Jr., 157-172. Lawrence, KS: The University Press of Kansas, 1970.

NEWSPAPERS

Colorado Springs Gazette. 1908.

Denver Times. 1903.

Kiowa County Press (Eads, Colorado). 1937. 1940. 1941. 1942. 1947.

The Miner's Register (Central City, Colorado). 1864. 1865.

Rocky Mountain News. 1864.

St. Louis Globe-Democrat. 1876.

