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# USING EURO-AMERICAN HUNTING DATA TO ASSESS WESTERN GREAT PLAINS BIOGEOGRAPHY, 1806–35

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**ABSTRACT**—Historic accounts from the 19th-century western Great Plains contain significant information on Plains ungulates and other animals, particularly as they relate to provisioning the Euro-American travelers. Using data derived from these accounts, a quantitative assessment of the hunting success of the Pike, Long, Glenn, and Dodge expeditions of the early 19th century is presented to ascertain the conditions of these species in the region. These data are then used to assess historiographic models of bison overhunting. This analysis indicates that the western Southern Plains and western Central Plains had differing trajectories of overhunting explained by temporally variable human and environmental impacts.

**Key Words:** biogeography, bison, Dodge, Glenn, hunting, Long, Pike, return rates

## INTRODUCTION

Traveling up the Arkansas River in the winter of 1821 to trade and trap, a party led by Colonel Hugh Glenn encountered a substantial Indian encampment near the confluence of the Arkansas and Apishapa Rivers. Major Jacob Fowler, whose journal documents the travels of the party, estimates the encampment eventually reaches 700 lodges—composed of Kiowa, Arapaho, Kiowa-Apache (or Plains Apache), Cheyenne, Comanche, and Shoshone (Coues 1898). After camping nearby for some days, Fowler notes that “the Indeans talk of moveing the Buffelow are now drove to Some distance and this I[s] not to [be] thought Straing as about one Hundred of them are Eaten In Camp Each day Sinc our aRivel.” In a journal entry that follows, Fowler notes that the Indians “furnish [us] With Plenty of the best of buffelow meet at a low Rate bu[t] do not Wish us to Hunt them our Selves—aledgeing We Wold drive the Buffelow all off” (Coues 1898).

This description of the Indian encampment and quantity of bison being consumed provides an important window into the subsistence needs of Plains Indians. As well, the large mixed camp is an apt demonstration of the early 19th-century coalescence of Indian groups in the upper Arkansas Valley for trade and animal resources. That the trappers were discouraged from hunting bison is a remarkable facet of their interaction with the Indians.

Concern that the white hunters would drive away game with their muskets, or the desire to continue to profit from selling bison meat, could underlie this prohibition. However, a parsimonious trade in horses and mules, along with the “low rate” for which the bison meat was sold, would suggest economic opportunity was not the only motive. Perhaps there was a sense, even by that time, that overhunting was occurring in the region, and denying outsider access to the remaining bison herds was a necessity.

The near extinction of the bison that took place in the 19th century is characterized by Elliot West (1995) as “the quintessential expression of human greed and its potential to gobble up nature’s bounty.” Attempts to understand the machinations that wrought the demise of the bison have long captured the attention of scholars and writers (cf. Hornaday 1889; Roe 1951; Isenberg 2000). Yet, despite the long history of research, questions remain: When and to what degree did overhunting, as well as other cultural and ecological factors of the late 18th and early 19th century, influence the destruction of the bison?

Dan Flores (1991) argues that in the Southern Plains, the annual numbers of bison harvested by equestrian Plains Indian hunters was sustainable well into the 1830s. Environmental degradation through drought and the introduction of European livestock, along with the unmitigated access to herds afforded by the 1840 peace between the Cheyenne, Arapaho, Comanche, and Kiowa, were the

drivers that initiated the diminution of the bison in this region. In the western Central Plains, Elliott West (1995) argues that the causes were species packing and climactic fluctuations, which along with the removal of the bison-rich buffer zone between the aforementioned groups who made peace in 1840, generally corroborates the model of Flores. But, keying in on issues of timing and the significance of human overhunting, Pekka Hämäläinen presents a different model of bison destruction in the Southern Plains.

Hämäläinen (2001) argues that significant bison decline began in the 1790s rather than after 1840, and proffers a causality based on large-scale overhunting rather than environmental degradation. The crux of the difference between the models lies in the conflicting interpretations of how many bison constituted a sustainable annual harvest. As Hämäläinen (2001) rightly indicates, some problems are due to that fact that these models are “geographically focused case studies” that require “more inclusive further research.”

To test these models, this study uses data from historical accounts to develop a better understanding of bison and other Plains ungulate abundance prior to 1840. This analysis will address how human impacts created different trajectories of overhunting in the Central and Southern Plains. Information from journal accounts of Euro-American travels along the Platte and South Platte Rivers and the Arkansas River between 1806 and 1835 will be used to develop quantitative and qualitative measures of Euro-American hunting success and animal abundance as a means of demonstrating whether or not bison and other Plains ungulate species became harder to acquire through time. Quantifiable differences in the hunting success of the Euro-American expeditions should reflect the changing conditions in this region in terms of Plains ungulate numbers and provide a means of temporally testing the bison diminution models. The travel corridors used by these expeditions through the region, and the general strategy of nonspecific encounter subsistence hunting, should provide a good estimation of the abundance and distribution of these animals along the route and facilitate a better understanding of the environmental and cultural conditioning of the region.

This study will focus on a region of the western Great Plains through which four key Euro-American expeditions passed in the early 19th century. The two major waterways transecting the region—the Arkansas River and the Platte/South Platte Rivers—provide the analytical cross-sections for this study as these were the westerling travel corridors for the Euro-American expeditions. The

journal accounts from the expeditions of Zebulon Pike (1806–7), Hugh Glenn (1821–22), Stephen Long (1820), and Henry Dodge (1835) comprise the primary data sets. This analysis will focus on the overlap in routes for the paired expeditions that occurred from the Grand Island on the Platte River and the Great Bend of the Arkansas River, respectively, to the mouth of Fountain Creek (Fig. 1). Of particular interest are notes on the numbers and locations of game animals and mentions of Indian groups’ location, size, and composition, along with other data that indicate game animal and/or Indian dynamics and territory. Detailed analysis of these expeditions provides two sets of comparable data illustrating the historical trajectory of Indian and game conditions based on the similarity among many characteristics of these expeditions, particularly in their timing and routes (Table 1).

The exploratory expedition led by Lieutenant Zebulon Pike in the fall and winter of 1806–7 is recounted in his own journal, which is the sole primary source used here (Jackson 1966). As one of the four expeditions tasked with exploring the recently purchased Louisiana Territory, the party of men led by Pike traveled up the Arkansas River to seek the sources of both the Arkansas and Red Rivers. The Pike party was eventually captured by the Spanish in the San Luis Valley and taken to Chihuahua (Jackson 1966; Weber 1992). His journal account provides the earliest detailed Euro-American documentation of the upper Arkansas River.

Hugh Glenn led a party of trappers and traders to the upper Arkansas in the fall and winter of 1821–22. The source of information on this expedition is the journal of the second-in-command, Jacob Fowler (Coues 1898). Issued a license to trade in the upper Arkansas region in 1821, the Glenn party represents one of the earliest trading ventures into the region made accessible by the newly opened Santa Fe Trail between the United States and Mexico (Stevens 1971:181–83). Beyond the Great Bend of the Arkansas, the journal of Fowler provides the first documented record of the upper reaches of this river since the expedition of Pike.

Two journal accounts from the scientific exploring expedition led by Major Stephen Long in 1820 provide details of a journey up the Platte River, then up the South Platte River, and down the eastern edge of the Front Range to the Arkansas River. Dr. Edwin James, the botanist and geologist for the expedition, kept a journal, and Captain John Bell was the official chronicler of the trip (James 1905; Fuller and Hafen 1957). These accounts provide the first detailed Euro-American documentation of the South Platte region and Rocky Mountain Front Range.

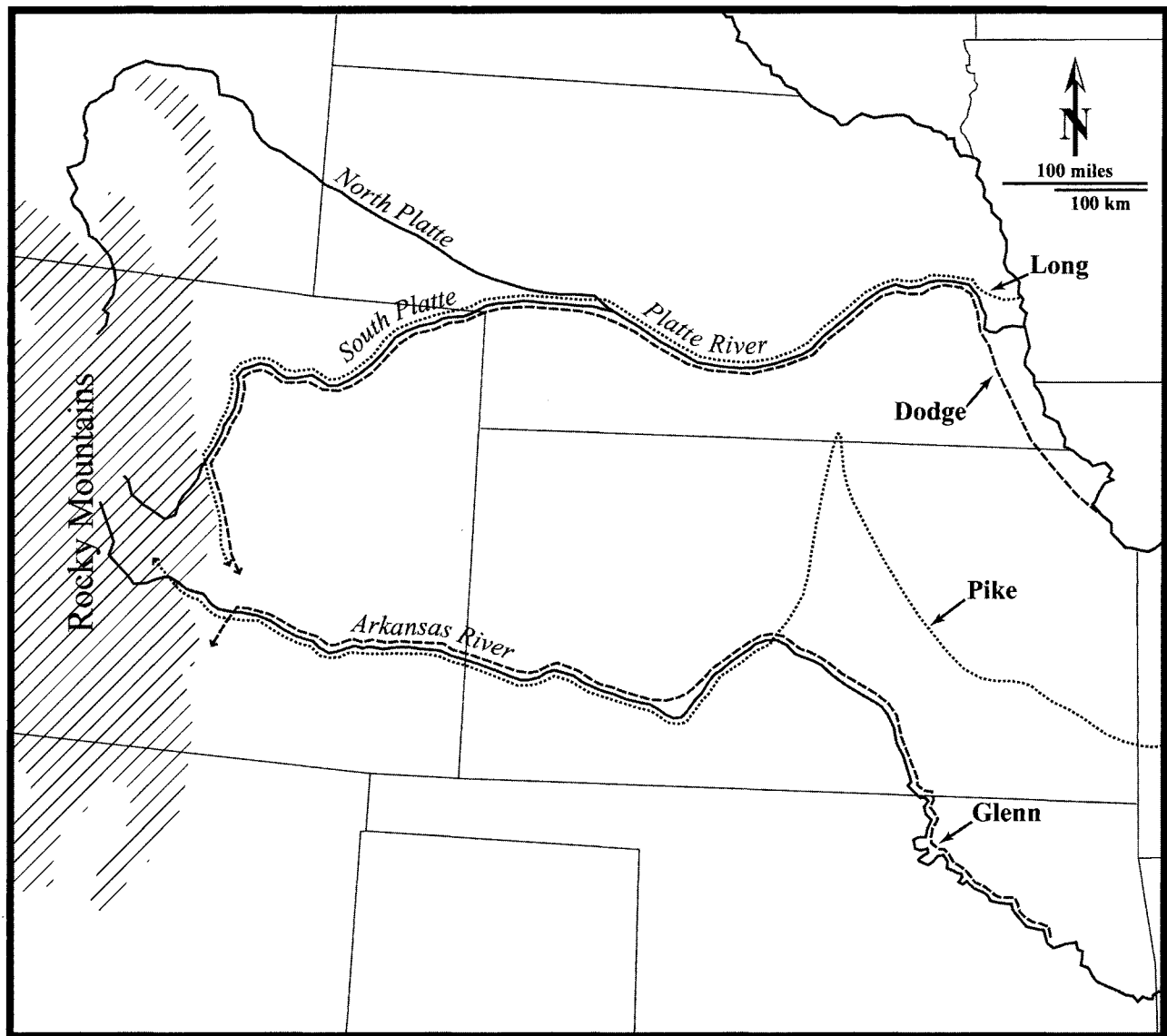


Figure 1. Western Great Plains showing portions of routes taken by Pike, Glenn, Long and Dodge expeditions.

TABLE 1  
COMPARABLE DATES OF EXPEDITIONS

Expedition	Number in party <sup>1</sup>	Date passing by Grand Island of Platte River Longitude 98.8° W	Date passing by Great Bend of Arkansas River Longitude 99.1° W	Arrive at mouth of Fountain Creek Longitude 104.6° W
Pike	24		October 24, 1806	November 23, 1806
Glenn	20		October 19, 1821	January 1, 1822
Long	22	June 14, 1820		July 16, 1820
Dodge	127	June 27, 1835		August 1, 1835

<sup>1</sup> This is the initial figure at the start of journey; these numbers fluctuated.

In 1835, Colonel Henry Dodge led the First Dragoon Regiment in an expedition that duplicated much of the route traveled by Long. The official journal account of this expedition was kept by Colonel Dodge, but two journals, those of Captain Lemuel Ford and Sergeant Hugh Evans, have been published as well (Pelzer 1926; Perrine 1927; U.S. Congress 1836). This expedition, sent west to make a display of the military prowess of the United States, made numerous entreaties to the Plains Indian groups of the region.

The region through which these expeditions traveled was changing rapidly and was on the threshold of even more dramatic changes. During the time between the earlier two expeditions—Pike and Long—a nascent fur trade emerged as trappers and traders converged into this heretofore hinterland. The latter expeditions of Fowler and Dodge were the vanguard to the opening of the Santa Fe Trail and the establishment of a bison robe trade along the Front Range and the constituent trading posts, respectively, which altered the human demography and biogeography of the region drastically.

## METHODS

This analysis will use the historic data to measure how the large ruminant resource base changes in the 15 years between the two Euro-American expeditions along each river. It does so by developing quantifiable measures of animal abundance and hunting success that have little precedent in the existing scholarship. Historic accounts, including the ones analyzed here, have been mined previously for the important data they contain pertaining to animal abundance, particularly large ungulate species and especially bison. Data from historic accounts compiled to determine bison herd sizes, bison ecology, range distribution, and abundances have proven essential to understanding the cultural history and prehistory of the Great Plains (e.g., Arthur 1975; Bamforth 1987, 1988; Isenberg 2000; Binnema 2001).

Two particularly innovative studies provide a methodological template for developing the quantitative and qualitative data used in this analysis. In one study, James Shaw and Martin Lee developed abundance indices for pronghorn, elk, and bison in the Southern Plains based on Euro-American accounts from 1806–57 (Shaw and Lee 1997; see also Hart 2001). These indices show statistically significant patterning through time, by species, and between the short-, mixed- and tallgrass prairie biomes. In the other study, L. Suzann Henrikson (2004) uses hunting data from journals of trappers to develop a

prey choice model for the Snake River Plain. The bison hunting success of trappers from the early 19th century is quantified in order to develop bison return rates that are incorporated into the model.

Return rates are a measure of the net caloric return derived from gathered or hunted food resources. In optimal foraging theory, these return rates are incorporated into diet breadth models or prey choice models that predict how foragers will extract resources from their environment (Kelly 1995). However, this study will develop return rates strictly as a proxy for hunting success rather than to incorporate into a model. Other than bison, return rates are calculated for the elk, pronghorn, turkey, and what are likely mule deer (see Kufeld and Bowden 1995).

The main comparative analysis, however, will be restricted to the four prey species—bison, elk, mule deer, and pronghorn—primarily hunted according to the accounts. Turkeys were a resource for the Arkansas River expeditions, and enough information exists to calculate a return rate, which is presented to show the relationship between caloric return and size class. As well, prairie dogs are eaten, and badgers, wolves, and a bear are shot; however, these are limited to the accounts of Pike and Fowler and have little comparative value (James 1905; Jackson 1966).

The formulas used to calculate the return rates follow Henrikson (2004). Return rates for each expedition are calculated for each species using the formula:

$$\frac{(\text{Edible weight [kg/individual]} \times \text{Energy value [kcal/kg]})}{(\text{Edible weight [kg/individual]} \times \text{Handling time [hr/kg]})}$$

The handling time of each species for each expedition is derived from the formula:

$$(\text{Total hunter hours} + \text{Total processing hours}) / (\text{Number of animals killed} \times \text{Edible weight [kg/individual]})$$

As this study is strictly looking at return rates in a historic context, no concessions are made for the use of guns or horses. In fact, the use of horses to transport the meat essentially equalizes the transport costs of all animals regardless of size.

In order to develop hard numbers on the return rates, constant values for a number of specific factors were formulated based on the journal information and data from other sources (Table 2; using data from Jensen 2000; Henrikson 2004; USDA 2004; Byers and Ugan 2005). The average hunting-party size was set at three for the Pike expedition based on the description in his journal of hunting

TABLE 2  
DATA USED TO DETERMINE RETURN RATES

Expedition	Game animal	Scientific name	Live Weight <sup>1</sup> (kg)	Edible fraction	Edible weight (kg)	Energy (kcal/kg)	Processing time (hr)	Hunting time <sup>2</sup> (hrs/day)
All	Bison	<i>Bison bison</i>	591	0.60	354	1,220	3	
All	Elk	<i>Cervus elephus</i>	318	0.60	191	1,110	2	
All	Mule deer	<i>Odocoileus hemionus</i>	95	0.60	57	1,200	1	
All	Pronghorn	<i>Antilocapra americana</i>	58	0.60	35	1,140	1	
All	Turkey	<i>Meleagris gallopavo</i>	6	0.79	5	1,570	1	
Pike								15
Long								25
Glenn								15
Dodge								50

<sup>1</sup> This value is the mean of the male and female weights.

<sup>2</sup> This value is applied to each day that hunting was recorded. It is the value derived from an average hunt time of 5 hours per man multiplied by the number in an average hunting party: 3 hunters for Pike and Glenn expeditions; 5 hunters for the long expedition; and 10 hunters for the Dodge expedition.

parties that range from one to four (Jackson 1966). This number was used for the comparably sized Glenn expedition, for which we lack information on exact hunting party sizes. Although his account contains references that range from a single hunter to a time when “every man, that had any pretensions to being a good shot” went out, the Bell journal initially lists five men designated as hunters, so this figure is used as the average hunting-party size for this expedition (Fuller and Hafen 1957). These values are consistent with the two to three hunters that a party of 13 to 17 members under the guidance of Thomas Farnham used in an 1839 journey up the Arkansas River (Farnham 1843), as well as the three to six hunters generally used by the Lewis and Clark expedition (32 to 43 members) on their journey up the Missouri River in 1804–5 (Lewis et al. 2002). For the considerably larger Dodge expedition, where the journals lacked any specific information, the hunting-party size was set at 10—a slight modification of the nine hunters sent out by an 1843 dragoon detachment numbering 110 men (Connelley 1925).

The average hunter day was set at five hours, which is an intuitively median value based on mentions of evening hunts and on other accounts ranging from all-day hunts to times when game was encountered and procured in the normal course of travel, without special effort. The processing time differences take into account the much larger size of bison and elk compared to the other animals.

Overall, these times also take into account the experience of the Euro-American butchers, the use of metal tools, and the degree to which the animals were butchered. For example, on the Pike expedition, butchering intensity ranged from what was required to extract “marrow bones for breakfast” to only taking “the choice pieces of meat” (Jackson 1966).

The total allotted hunting hours per day (see Table 2) was divided evenly among each animal killed, regardless of species, if multiple animals were procured in a single day. When the hunts returned no game, the hours were given to a particular species if referenced as the object of the hunt, as when Fowler relates, “[T]hree men Went With Horses on the Hunt of Buffelaw but Returned With out seeing any this day” (Coues 1898). Where unsuccessful hunts were undertaken without species specificity, the hours were evenly divided between all. The Dodge expedition journals contained no specific numbers on the amounts of bison killed, so round estimates ranging between five and 20 were assigned based on the size of the expedition and comments such as “killed them in great numbers” (Perrine 1927). Based on an estimated 4,000 calorie/day diet, these amounts would have fed the dragoons for a period ranging from four to 17 days, figures that do not reflect actual hunting periodicity recorded in the journals but possibly demonstrate the minimal processing of the bison killed. This discrepancy belies

TABLE 3  
HUNTING DATA

Game animal	Hunter hours				Number of animals killed				Processing/handling hours				Return rates (kcal/hr)			
	Pike	Glenn	Long	Dodge	Pike	Glenn	Long	Dodge	Pike	Glenn	Long	Dodge	Pike	Glenn	Long	Dodge
Bison	269	202	152	350	55	24	16	75	165	72	48	225	54,709	37,771	22,976	56,221
Elk	14	29			2	5			4	10			23,567	27,206		
Mule deer	28	43	249		4	7	21		4	7	21		8,535	9,577	5,319	
Pronghorn	19		148		2		10		2		10		3,846		2,525	
Turkey	5	41			1	8			1	8			1,308	1,282		

the problem with trying to accurately gauge the amount of bison killed by this expedition, especially when it was likely that bison were killed wantonly simply for sport.

Notions of sport hunting do find their way into the journals, particularly those of the dragoons. The fascination with bison hunting in particular eventually fed into a developing sportsman ethos that became important in later conservation movements (Reiger 2001). However, the early 19th century was a time when bison as a resource was largely viewed as inexhaustible. The massive bison herds of the Great Plains gave early Europeans the impression that no amount of killing would have a lasting impact on their numbers (Gard 1959). This attitude undoubtedly manifested itself in animals being lightly butchered to completely wasted, but these particular parties were hunting for subsistence, and thus the data from these hunts are much more relevant than that from the European sport hunters who were pursuing game in the western Great Plains by the 1830s (Merritt 1985).

## RESULTS AND DISCUSSION

The calculated return rates from the four expeditions are presented in Table 3. The data indicate some significant differences among the expeditions in terms of both hunting success and in the breakdown of animals killed. The return rates increase through time between the northern expeditions and conversely decrease through time between the southern expeditions. It is of note that the return rates show bison to be significantly more efficient to procure than the other animals killed by the Euro-American hunters. Understanding why bison were so much more efficient involves factoring in both their size and behavioral characteristics, along with a cultural preference for hunting and eating these animals. Bison gregariousness and poor eyesight, combined with the hunters' use of

horses and guns, made bison relatively easy to hunt. Furthermore, bison are the largest animal in the Great Plains: return rates calculated elsewhere also rank bison highly (Henrikson 2004; Byers and Ugan 2005) and demonstrate that return rates generally positively correlate with body size. Bison were the primary food source of indigenous Plains hunters, to which the Glenn party was witness.

The prodigious appetite for bison of the large Indian encampment encountered by the Glenn party negatively impacted Euro-American hunting success on the upper Arkansas River. Encamped at the mouth of Fountain Creek in proximity to the aboriginal camp, Fowler sends hunters "out to the mountains to Hunt for Buffelaw" for days at a time and generally has little success—sending hunters out multiple times who return with no game (Coues 1898). As well, the procurement of turkeys, based on return rate, is indicative of the poor hunting in the periphery of the wintering Indians.

The Pike expedition hunters killed the greatest variety of animals and by far the most bison of the three smaller groups. Based on return rates, Pike's party is a close second to the Dodge expedition in terms of bison hunting success. This is despite entering the area on the heels of a severe two-year drought in 1805–6 (Cook et al. 2007). Until the party entered the mountains, the Pike party seems to have little trouble acquiring food. As well, Pike is following the weeks-old trail of a large Spanish expedition led by Facundo Melgares (Olivia 2006) and reports evidence of the Spaniards eating a horse (Jackson 1966).

The hunting success of the Pike party is surprising given the time of year, the fact that they were following (albeit weeks later) a large Spanish expedition, and that it was the end of a severe drought. This success could be attributed to animal herds concentrating in the winter shelter afforded by the Arkansas River bottoms. Furthermore, Pike does not physically encounter any Indians until the

mouth of the Apishapa River, which could also be a factor in the hunting success of his expedition through this area, especially considering the myriad Indian groups and numbers that the Glenn party later encountered on the upper Arkansas. Moreover, during the interim between Pike and Glenn, Cheyenne and Arapaho groups had moved south into the region, which increased both the human population and pressure on the resources in the area (Sherow 1992).

The Long expedition has the lowest return rates; however, this excursion took place in the midst of a severe drought (1818–20), as attested by the moniker “Great American Desert” that Long ascribed to the region (Cook et al. 2007). As Long was traveling through a region impacted by drought, his return rates may reflect the poor forage conditions. Seasonality could also be a factor in that during the spring and summer, herds are less likely to be concentrated in the riparian zones. It is telling that the hunters killed more mule deer and pronghorn than did the other expeditions, a possible reflection of resource depression and the necessary consumption of riparian zone browse by these species. On the other hand, Colonel Dodge traveled through the area in a time of much more favorable precipitation.

The First Dragoons passed through the region during a wetter-than-normal period, two years after the wettest year (1833) on record between 1500 and 1990, according to tree-ring reconstructions (Cook et al. 1999; Stahle et al. 2007). Although both Long and Dodge witness evidence of warfare along the Platte and South Platte in the form of fortified camps, neither party actually encounters Indians until reaching the Arkansas (Fuller and Hafen 1957; Pelzer 1926). Also favorable to the Dodge expedition were cultural factors that indirectly and fortuitously resulted in better bison hunting.

The region through which Dodge passed was at the time a “section of country . . . called the neutral ground, [which] extends from the forks of the Platte almost to the foot of the mountains. It will not admit of the permanent resident of any Indians. . . . The Arapahos and the Cheyenes sometimes move into this country for a short time during the summer to hunt buffalo” (U.S. Congress 1836; White 1978). Conflict among the Cheyenne and Arapaho with groups to the east over this buffalo range produced what Dan Flores (1991) describes as “an interesting type of ecological development . . . buffer zones occupied by neither side and only lightly hunted.” Animals were attracted to these liminal zones by the lack of sustained hunting pressure, and the success of the dragoons has to be attributable in some degree to this phenomenon.

A qualitative assessment of bison abundance shows patterning that reinforces the inferences from the return rate data. The assessment of numbers by the chroniclers of the expeditions varies greatly—ranging from instances of precise numeric descriptors to the generic “saw buffalo” (Jackson 1966). An ordinal index was developed from the descriptive and numeric terms used in the journals to describe the amount of bison encountered. Based on this index, the locations where bison were encountered are plotted based on longitude (Fig. 2). This spatial accounting provides a rough estimate of the east-west spread of these animals along the Platte/South Platte and Arkansas Rivers.

The Platte/South Platte expeditions show considerable overlap and demonstrate the propensity for bison in the region west of the Platte fork despite the different environmental conditions each party encountered. Dodge seems to have encountered larger numbers of bison, a product of the buffer zone. Data from the two expeditions indicate that bison were more evenly distributed along the route during the earlier expedition of Long, a possible reflection of a lack of hunting pressure or of a less constrained condition prior to the influx and conflict catalyzed by the Cheyenne and Arapaho movement into the area.

Based on the journal accounts, the wild horse distribution overlaps the bison distribution in the game-rich region west of the Platte fork, especially during 1835 when the dragoons pass through. Horses were encountered slightly farther east on the Arkansas, and the Pike expedition reports them more frequently. It has been estimated that there were tens of thousands of wild horses between the Platte and Arkansas, and that there may have been just as many pronghorn as bison inhabiting the Plains (Flores 1991; Hart 2001).

Mule deer, elk, and pronghorn are less informative for the northern expeditions because the chroniclers of the Dodge expedition make only a single mention of these species (Perrine 1927). Again, although rarely mentioned in the accounts of the Arkansas expeditions, Pike encountered ungulates other than bison generally farther east than did Glenn, perhaps an indication of animals contracting westward in the face of Euro-American expansion. Mule deer, elk, horse, and pronghorn are never mentioned in the numbers that bison are in the journals, which is not surprising as these species lacked the overall population and herding behavior of the latter.

Aside from general distributions, the journals also contain data on herd composition and movements, particularly the bison. After forming large mixed herds for the rut in July and August, bison segregate into nursery



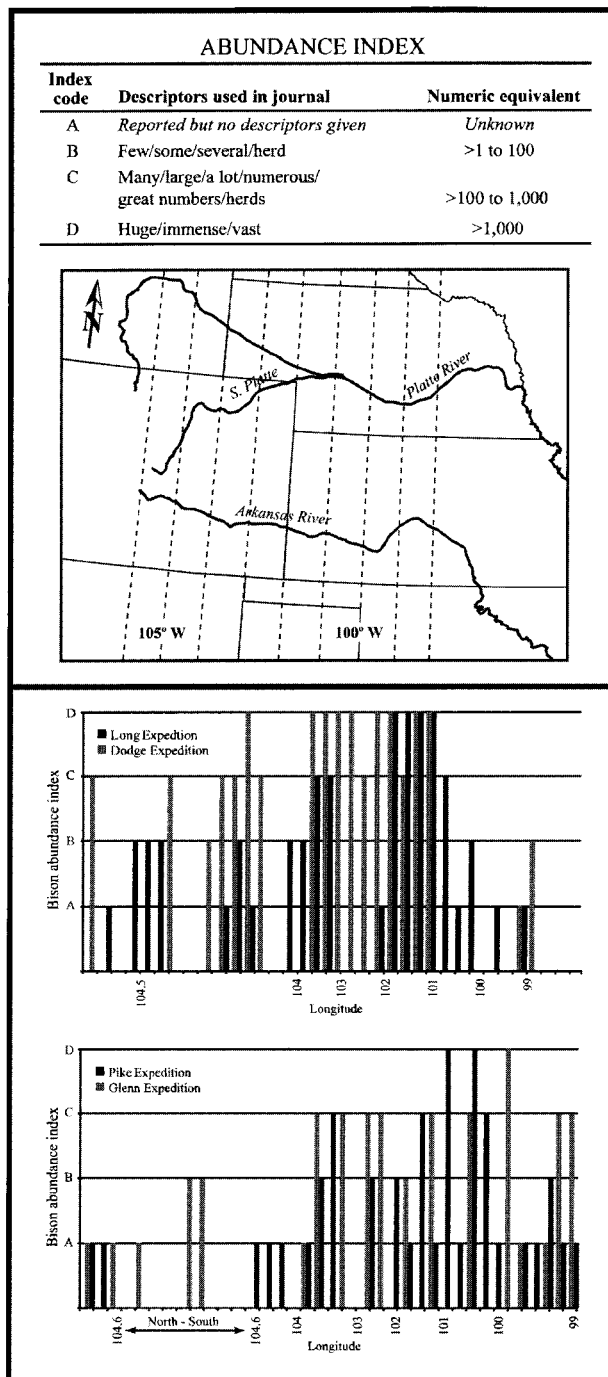


Figure 2. Bison range and abundance based on journal accounts.

herds (composed of cows/calves and juvenile animals) and bachelor herds (composed primarily of mature bulls) for the rest of the year (Bamforth 1988). This separation influences both bison distribution and human hunting strategies.

Fowler reports on October 25 that “the Hunters killed two Fatt Cows” in the vicinity slightly west of 99° longi-

tude, which are the first cows reported after several days of lamenting the lack of them to hunt (Coues 1898). Fowler was intent on attaining cows because he knew that they are in better physical condition than the bulls following the rut. On November 4, Pike reports seeing the first cows at roughly 100.7° longitude. Pike encounters nursery herds around 100 miles farther west than Glenn reports them, possibly explained by the 1805–6 drought pushing animals to the more drought-resistant grama and buffalo grasses of the shortgrass steppe (Julander 1945; Wedel 1986). To the north, Long encountered drought-impacted nursery herds even farther west in the shortgrass steppe and reports large numbers of bison moving south across the South Platte into the Colorado Piedmont area (Fuller and Hafen 1957).

## CONCLUSIONS

The success of the Euro-American hunters and the biogeography of the animals they encountered in the western Great Plains are reflective of the cultural and environmental conditions of the early 19th century. Particularly along the Arkansas, the existence of a trading locus (later made permanent by the establishment of Bent’s Fort) attracted Indian groups (Hämäläinen 1998) and, as Fowler documents, impacted the game in the area. Along the Platte/South Platte, internecine aboriginal warfare over territory kept hunting pressure light in the High Plains east of the Front Range, especially in the 1830s as Dodge witnessed. However, shortly after the dragoons moved through the area, an established and lively trade develops based on extraction of bison robes from the High Plains herd.

The highly variable and seasonal Great Plains climate that can vacillate between extreme wet and dry, even annually, undoubtedly affected Euro-American hunting success. The severe droughts that impinged both the expeditions of Pike and Long appear to have affected the latter party to a much greater extent. Seasonally, water, food, and shelter constrained the movements of the hunted animals. The fall and winter seasonality of the Pike expedition, when compared to the summer expeditions, seems to have had good success acquiring game in the Plains, possibly a reflection the shelter and forage afforded by the Arkansas River riparian zone.

The consistent masses of bison just west of the Platte forks witnessed by Long and Dodge demonstrate stability not witnessed in the Arkansas Valley. The trajectories of change from the Arkansas River expeditions, vis-à-vis the return rates, generally confirm the model proposed

by Hämäläinen in that overhunting was occurring before 1840. Furthermore, the coalescence of Comanche, Kiowa, Cheyenne, and Arapaho witnessed by Fowler (Coues 1898), along with the mixed camps described by James and Bell (James 1905; Fuller and Hafen 1957), indicate that there were periods prior to the Great Peace when these groups exploited the resources of the upper Arkansas. However, the increased hunting success of the dragoons does support the Flores-West model of buffer-zone refugium into the 1830s. Overall, what these findings clearly demonstrate are the differing contexts and trajectories of change between the Arkansas and Platte/South Platte zones. The upper Arkansas was the destination for migrating Plains Indian groups in the early 19th century, and, long a trade center, its importance increased with the influx of Mexicano and Euro-American trade goods and livestock following the Mexican Revolution (Hämäläinen 1998). This influx of people and animals began earlier than in the north and was more profound, resulting in earlier negative impacts on the bison.

The Flores-West model is a more accurate reflection of the timing that is evident in the western Central Plains. Bison numbers do not appear to diminish during the period analyzed here. Rather than a result of the Great Peace of 1840, the scales were tipped against the bison in this region with the peace of the Cheyenne, Arapaho, and Lakota, who entered the forks of the Platte in the 1830s. This détente, which opened up a large game-rich buffer zone (White 1978), catalyzed the bison robe trade through the establishment of the North and South Platte trading loci in the 1830s.

The use of return rates and abundance indices represents empirical methods for looking at the early historic biogeography of the western Great Plains and provide a means to test the models developed to explain bison destruction. However, these numbers do not provide a concrete cultural and/or environmental causality for the change exhibited. Further analysis of historic accounts should bring more data to bear on this issue. Increasing the scholarly focus on the underpinnings of the early human impacts on the animals of the western Central Plains, such as that initiated by Flores, West, and Hämäläinen, will add the needed clarity and robusticity to the history of the Great Plains.

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