

War Zones and Game Sinks in Lewis and Clark's West

PAUL S. MARTIN* AND CHRISTINE R. SZUTER†

*The Desert Laboratory, Department of Geosciences, University of Arizona, 1675 W. Anklam Road, Bldg. 801, Tucson, AZ 85745, U.S.A., email pmartin@geo.arizona.edu

†University of Arizona Press, 1230 North Park Avenue, Suite 102, Tucson, AZ 85719, U.S.A.

Abstract: *The journals of Lewis and Clark reveal a major difference in the taxa, numbers, and behavior of megafauna on either side of the Rocky Mountains in western North America. Two prior events set the stage for what Lewis and Clark would find. The first was the extinction around 13,000 years ago of two-thirds of the native megafauna of the American West. The second was the effects on Indians of deadly new diseases and new technologies brought by Europeans in the post-Columbian era. Populations of large animals, which were preferred prey for native people, were not immune to European influence. Along the Columbia River corridor west of the Rockies, tens of thousands of people lived in a game sink. Here Lewis and Clark's party found too few animals to live off the land by hunting. They adapted poorly to the local diet of fish and roots offered by the Nez Perce and bought dogs and horses to sustain themselves. To the east, uninhabited lands along the Upper Missouri and the Yellowstone rivers supported an abundance of wild game, especially bison, elk, deer, pronghorn, and wolves. This game source occupied part of a buffer zone of 120,000 km² probed by various Indian war parties, some of them armed with muskets. William Clark recognized the relationship and near the end of their journey he wrote that they found large numbers of large animals in the land between nations that were at war. Both the abundance of game in buffer or war zones and scarcity of big game in sinks have been misinterpreted as a natural or typical condition. Although efforts to restore ecosystems to what is described in early journals may have merit, they are aimed at a flickering target. Long before these journals were written, the land had been stripped of most of its native megafauna through human influence. In the absence of humans, we predict that much larger populations of bison, elk, deer, and wolves would have ranged the West than were reported in historic documents.*

Zonas de Guerra y Depresiones de Animales de Caza en el Oeste Americano en Tiempos de Lewis y Clark

Resumen: *Los documentos de Lewis y Clark revelan una gran diferencia en los números de taxa y la conducta de la megafauna en ambos lados de las montañas Rocallosas del Oeste de Norte América. Dos eventos anteriores establecieron la situación de lo que Lewis y Clark encontrarían. El primero fue la extinción de dos tercios de la megafauna nativa del Oeste Americano, hace alrededor de 13,000 años. El segundo fueron los efectos de las nuevas enfermedades mortales y nuevas tecnologías traídas por los europeos sobre los indios en la era posterior a Colón. Los animales grandes de los cuales la gente nativa dependía no fueron inmunes a la influencia europea. A lo largo del corredor del Río Columbia al Oeste de las rocallosas, decenas de miles de gentes vivían en una depresión de animales de caza. Aquí el grupo de Lewis y Clark encontró muy pocos animales como para sobrevivir de la caza. Ellos se adaptaron pobremente a la dieta local de peces y raíces ofrecidas por los Nez Perce y compraron perros y caballos para mantenerse. En el Este, las tierras inhabitadas a lo largo de los ríos Missouri y Yellowstone soportaban una gran abundancia de animales de caza mayor, especialmente bisontes, alces, venados y lobos. Estos recursos ocuparon parte de una zona de amortiguamiento de 120,000 km² explorada por varios grupos guerreros de indios, algunos de los cuales estaban armados con mosquetes. William Clark reconoció esta relación y cerca del final de su viaje escribió que encontraron abundantes cantidades de animales grandes en las tierras entre naciones que se encontraban en guerra. La abundancia de animales de caza en zonas de amortiguamiento o de guerra y la escasez de animales grandes de caza en depresiones ha sido mal intepretado como una condición natural o típica. A pesar de los esfuerzos para restaurar ecosistemas hacia lo que ha sido descrito en estos tempranos viajes puede tener un mérito, están dirigidos a un blanco incierto, durante el tiempo en que estos documentos fueron escritos, la mayoría de*

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la megafauna nativa ya había sido impactada debido a la influencia humana. Predecimos que en ausencia de humanos, poblaciones de mamíferos grandes aún mayores de lo que ha sido reportado en documentos históricos podría haber ocupado el Oeste Americano.

Introduction: Historical Revisions

How the bison survived is a question regularly asked in discussions of the possibility of a prehistoric overkill to account for North American extinctions of large mammals at the end of the Quaternary. Not only did bison survive, but in certain parts of the western United States they did so in impressive numbers, along with large numbers of elk, deer, wolves, and bears. Various editions of the journals of Lewis and Clark (Moulton 1983–1997), for example, verify these facts for the state of Montana in the years 1804–1806.

In contrast, although usually glossed over with scant comment, are other accounts from other parts of the West that describe Lewis and Clark, the Astorians, and other early fur traders frequently buying and eating dogs and horses from the American Indians. Barring discovery by a war party, living off the land was less of a challenge for Europeans to the east of the Rockies than to the west in the Columbia Basin. There they found little to hunt, and the native diet of dried salmon and roots did not always agree with them. Where were the bison?

In recent years anthropologists and conservation biologists have suggested that the hunting strategies of subsistence hunters are opportunistic, not density dependent or designed for sustained yield (Kay 1994, 1997; Alvard 1995; Winterhalder & Lu 1997 and references therein). Both historically and prehistorically, an opportunistic hunting strategy reduced or suppressed high-ranked resources in parts of western North America (Kay 1994; Truett 1996; Broughton 1997). These findings amplify the evidence from various disciplines that indicates a considerable human impact on the environment before as well as after European contact (Denevan 1992; Kay 1994; Dickinson 1995; White 1996). The findings also impinge on the much-debated “Pleistocene overkill” model (Martin 1990; Stuart 1991; Burney 1993; Winterhalder & Lu 1997), which attributes extinction of two-thirds of the large mammals once native to western North America (Table 1) at least in part to human hunting of preferred prey.

In North America the last mammoths occurred in Clovis archaeological sites that are consistently dated to 13,000 years ago (Taylor et al. 1996). This is the approximate time of extinction of megafauna from other well-dated deposits (Martin 1990). Since these extinctions, the archaeological record indicates that few if any important megafaunal habitats on the continent escaped potential human influence. If an idealized wilderness would be one entirely free of human influence, the proper environment to

consider is that of the Late Quaternary, over 10,000 years ago, prior to megafaunal extinctions (Table 1). All historic reports, including those of Lewis and Clark, portray a culturally modified landscape.

Nevertheless, in certain conspicuous cases historic field evidence appears to be at odds with both foraging theory, the rejection of the “pristine,” and the overkill

Table 1. Large (>45 kg) mammals of the Late Quaternary, western United States and northern Mexico.

Scientific name	Common name
<i>Alces alces</i>	moose, moose deer
<i>Antilocapra americana</i>	pronghorn
<i>Arctodus simus</i> *	giant short-faced bear
<i>Bison bison</i>	bison
<i>Bison</i> ssp.*	extinct taxa of bison
<i>Bootherium bombifrons</i> *	bonnet-headed musk ox
<i>Camelops besternus</i> *	western camel
<i>Canis dirus</i> *	dire wolf
<i>Canis lupus</i>	gray wolf
<i>Cervus elaphus</i>	elk, wapiti
<i>Equus conversidens</i> *	Mexican horse
<i>Equus occidentalis</i> *	western horse
<i>Equus</i> sp.*	extinct equids
<i>Euceratherium collinum</i> *	shrub ox
<i>Felis concolor</i>	mountain lion
<i>Glossotherium harlani</i> *	big-tongued ground sloth
<i>Glyptotherium floridanum</i> *	glyptodont
<i>Hemiauchenia macrocephala</i> *	long-legged llama
<i>Mammuth americanum</i> *	American mastodon
<i>Mammuthus columbi</i> *	Columbian mammoth
<i>Mammuthus jeffersonii</i> *	Jefferson's mammoth
<i>Mammuthus exilis</i> *	dwarf mammoth
<i>Mammuthus primigenius</i> *	woolly mammoth
<i>Megalonyx jeffersonii</i> *	Jefferson's ground sloth
<i>Miracionyx trumani</i> *	American cheetah
<i>Mylohyus nasutus</i> *	long-nosed peccary
<i>Navaboceros fricki</i> *	mountain deer
<i>Nothrotheriops shastensis</i> *	Shasta ground sloth
<i>Odocoileus hemionus</i>	mule deer
<i>Odocoileus virginianus</i>	white tail deer
<i>Oreamnos americanus</i>	mountain goat
<i>Oreamnos harringtoni</i> *	Harrington's extinct mountain goat
<i>Ovis canadensis</i>	bighorn
<i>Panthera leo atrox</i> *	American lion
<i>Panthera onca</i>	jaguar
<i>Platygonus compressus</i> *	flat-headed peccary
<i>Rangifer tarandus</i>	woodland caribou
<i>Smilodon fatalis</i> *	saber tooth
<i>Tapirus californicus</i> *	extinct tapir
<i>Ursus americanus</i>	black bear
<i>Ursus arctos</i>	grizzly bear

*Extinct species.

model. For example, if subsistence hunters were strongly attracted to bison as preferred prey, and if early hunters eliminated the mammoth and other large mammals (Table 1), how *did* bison survive? Not only did the genus *Bison* survive the extinctions of the Late Quaternary, but in parts of the West as late as the 1870s, local populations of bison were estimated in the tens of thousands at any one overlook, with half a million or more seen in a day (Botkin 1995). Bison cropped the grass so closely that early traders found scant pasture for their horses (A. Henry in Coues 1897). Despite the fact that both nomadic and settled tribes of Indians hunted bison, the animals thrived in certain regions. The scenario is contrary to the concept that a high-ranked resource, in this case bison, would be among the first to disappear when subjected to intensified hunting.

We advance two possible solutions to the paradox of abundant bison surrounded by skilled hunters. The first is the cultural holocaust of Indians following Old World contact (Denevan 1992; Diamond 1997). Especially severe were new pandemic diseases that repeatedly erupted, destroying 50–95% of the native population (Dobyns 1993; Larsen 1994).

The second is the war zone or buffer zone phenomenon, a consequence of intertribal warfare or tensions. In his classic ethnohistory, Hickerson (1965, 1970) shows that desirable game animals heavily hunted in one region were lightly hunted in another. Within an intertribal buffer zone, empty quarter, neutral zone, no-man's-land, or war zone—we use these words interchangeably to reflect the dynamics of intertribal politics—high-ranked prey found shelter. Subsistence hunters in Wisconsin and Minnesota in the eighteenth and nineteenth centuries, entering the game-rich, forest-prairie ecotone between the Chippewa (Ojibwa) and the Sioux (Lakota), might be hunted themselves. Between the tribes, wild game (deer and, locally, elk and bison) thrived. From Hickerson's data (1970) we estimate that the Wisconsin-Minnesota war zone varied in area from 40,000 to 100,000 km². Following a government-negotiated peace treaty, deer hunters were safe: they hunted freely and deer rapidly declined (Hickerson 1965). Wildlife biologists have found merit in Hickerson's war zone hypothesis and employed it in modified form to account for deer survival in a "no-wolves' land" between territories of adjoining packs (Mech 1977). We adopt Hickerson's model to account for game sources and sinks within metapopulations of megafauna found by Lewis and Clark.

Competing Hypotheses

The interpretation usually invoked to explain early historic patterns of large-animal distribution is environmental. Changes in range, diversity, or numbers of large animals are thought to reflect the changing productivity of

the habitat. In this century an increase in numbers of mule deer and their predators, mountain lions, is attributed to increased heavy grazing by introduced livestock (Berger & Wehausen 1991) or to a change in fire regime (Gruell 1986), both changes favoring growth of shrubs attractive to mule deer. Although he noted the scarcity of mule deer in archaeological records and accepted the hunting pressure argument elsewhere, Grayson (1993) felt it was "far more likely that the modern abundance of these animals [deer] in the Great Basin has resulted from complex interactions among plants, domestic livestock, and the deer themselves."

Lack of bison in the intermontane West is explained as a matter of low overall forage production (Van Vuren 1987) or by dormancy of caespitose grasses at the season when lactating bison need maximum green foliage to support the late spring calf crop (Mack 1989). In contrast, Daubenmire (1985) believed that the intermontane grasslands would be suitable for bison. He attributed their absence to abnormal snow depth.

None of these possibilities can be rejected. All may account for change in numbers of game animals historically and prehistorically. As Kay (1994) shows, however, human predation has rarely been considered a possible regulating mechanism in the case of game irruptions. Could hunting by American Indians contribute to or even override the natural regulation of animal numbers? Before developing Kay's "war zone" alternative, we review the shift in the numbers of game across the Rocky Mountains as reported in the journals of Lewis and Clark (Moulton, especially volumes 4–8; from the date of an observation one can verify context by consulting any edition of the journals).

Lewis and Clark in a Hunter's Paradise

The Lewis and Clark party relied on game for their food supply and reported regularly on the numbers and behavior of large animals along with their daily game bag. In the summers of both 1805 and 1806 along the Upper Missouri and the Yellowstone rivers in Montana, they found what Indian informants at Fort Mandan had described: abundant and fearless bison, elk, deer, pronghorn, wolves, and grizzly bears. The party enjoyed an ample supply of choice cuts, fat, and marrow bones, although in late spring adult bison were in poor condition and the party butchered calves instead.

In the first 150 km upriver, west of Fort Mandan, on the Upper Missouri, they found virtually no game, a scarcity they attributed to heavy hunting locally by the Hidatsa and Assiniboin. As they approached the mouth of the Yellowstone River in late April, matters changed. Game became abundant and gentle, and on 4 May Lewis saw "immense quantities of buffalo in every direction . . . they are extremely gentle the bull buffaloe particu-

Table 2. Samples of Lewis and Clark's game kill during travel along the Upper Missouri River drainages and the interior Columbia River drainages, 1805–1806^a.

	Upper Missouri River, 25 Apr.-13 Jul. 1805	Columbia River, 18 Sep.-6 Nov. 1805	Camp Clatsop, 1 Jan.-19 Feb. 1806	Columbia River, 23 Mar.-11 May 1806	Yellowstone and Upper Missouri rivers, 30 Jun.-18 Aug. 1806
Deer	79	28	8	38	191
Elk	50	0	51	22	51
Bison	44	0	0	0	55
Pronghorn	8	0	0	0	9
Bear	12	0	0	1	12
Dog	0	101+	5	83+	0
Ration units ^b	105	7	40	26	150

^aEach sample spans 50 days; the Camp Clatsop sample is from a single locality. Daily game bag (kill) records from Moulton volumes 4 to 8.

^bLewis's ration unit, the number of animals needed to feed the party in 1 day, is computed as follows: bison (Bison) = 1.0; elk (Cervus) = 1.3; deer (Odocoileus) = 4.0; bear (Ursus) = 1.3; and pronghorn (Antilocapra) = 8.0.

larly will scarcely give way to you" (journal quotations are unedited). The following day he found "Buffaloe Elk and goats or Antelopes feeding in every direction; we kill whatever we wish. . . ." As for wolves, "we scarcely see a gang of buffalo without observing a parcel of these faithfull shepherds on their skirts in readiness to take care of the maimed and wounded." And the day after, "it is now only amusement for Capt. C. and myself to kill as much meat as the party can consume." Beaver were fearless, numbers of them peeping at the boats from their holes in the bank. Similar accounts of great numbers of game, often approachable and gentle, are typical of most journal entries west to Great Falls, where Lewis estimated 10,000 bison in one sighting. From the mouth of the Yellowstone to Great Falls, the only part of the Missouri not supporting big game in large numbers was a strip above the mouth of the Musselshell River, where sterile soils known to fur traders as the Mauvais Terres (the Badlands) yielded little forage.

Between 25 April and 13 June 1805, in 50 days of travel along the Upper Missouri between present-day Williston, North Dakota, and Great Falls, Montana, the expedition killed 79 deer, 50 elk, 44 adult bison, 7 bison calves, and 12 grizzly bears (Table 2). In addition, they killed 9 mountain sheep, 8 pronghorn, 3 wolves, and many beaver, and they caught or killed a variety of small game. They also killed elk and deer for hides used in trade, for clothing, and to cover an ill-fated iron-frame boat.

Lewis (13 July) acknowledged that "We eat an immensity of meat." He estimated their daily ration unit (the amount of game needed to feed the party) by the following formula: "it requires 4 deer, an Elk and a deer, or one buffaloe, to supply us plentifully 24 hours. Meat now forms our food principally as we reserve our flour, parched meal and corn as much as possible for the rocky mountains which we are shortly to enter, and where from the indian account [Hidatsa at Ft. Mandan the previous winter] game is not very abundant."

To Lewis's daily ration unit—with bison (*Bison*) set at 1.0, elk (*Cervus*) at 1.3, and deer (*Odocoileus*) at 4.0—

we add bear (*Ursus*) at 1.3 and pronghorn (*Antilocapra*) at 8.0. We omit kills of beaver, porcupine, marmot, badger, rabbit, upland game birds, and waterfowl. In the 50 days until their arrival at Great Falls, the expedition obtained 105 ration units, or an average of 2 units of big game per day (Table 2). This is twice Lewis's estimate of their daily requirement to live off the land. They did not store dry meat for the scarcity that they knew loomed ahead. When game declined near Three Forks, Montana, Lewis complained: "Nothing killed today and our fresh meat is out. When we have a plenty of fresh meat I find it impossible to make the men take any care of it, or use it with the least frugality" (31 July 1805). On their return in July 1806 the party divided (Fig. 1). Lewis explored the game-poor Marias River and Clark the game-rich Yellowstone. Their 50-day bag of 150 ration units exceeded that of the previous year by 50% (Table 2).

Devoid of permanent settlements and rich in wildlife, the Upper Missouri in the days of Lewis and Clark is commonly regarded by historians, biologists, and TV producers alike as the very essence of "wild" America. We suggest instead that an abundance of game along the Upper Missouri reflected the status of the area as a buffer zone, depopulated by warfare, disease, or both. War parties of various tribes or nations were ever at hand, and anyone hunting, processing, and drying meat or trapping beaver might be killed. This in fact was the fate of George Droillard and John Potts, two former members of the Corps of Discovery who returned a few years later to trap at Three Forks. We estimate that the Upper Missouri war zone extended west from the mouth of the Yellowstone up both rivers to Three Forks, roughly 500 km in length by 240 km in width, an area of about 120,00 km² (Fig. 2).

Paradise Lost

In North Dakota during the winter of 1804–1805, the Mandans and Hidatsa informed the captains that, if they

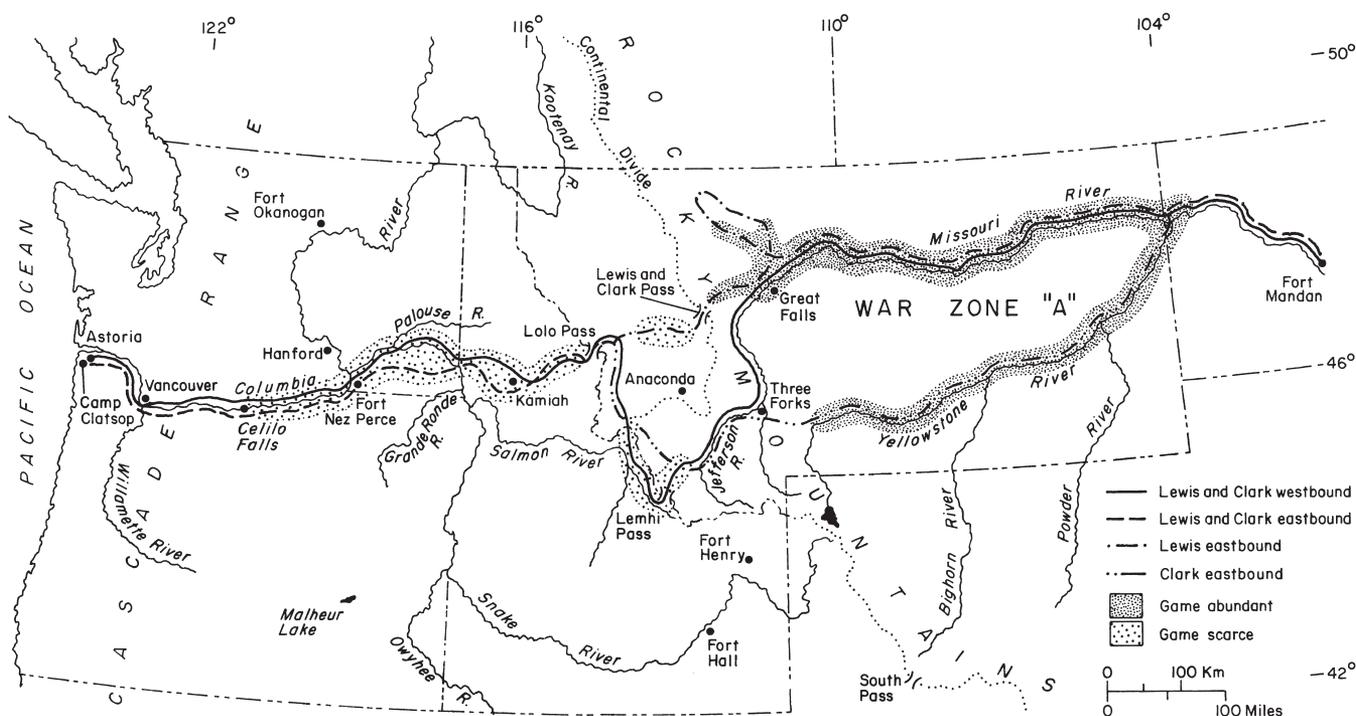


Figure 1. Route of Lewis and Clark, 1805–1806, showing regions of abundant and scarce big game. War zone A embraces the Upper Missouri from Three Forks and Grand Falls to the mouth of the Yellowstone. (For historic war zones and distributions of American Indian nations in the region, see Fig. 2.)

proceeded upstream from Great Falls, buffalo would disappear and other big game would become scarce. This is essentially what they experienced.

The first Indians they encountered in 4 months since leaving Hidatsa hunting grounds below the mouth of the Yellowstone were Shoshone (Sacagawea's people) preparing to cross Lemhi Pass on the Continental Divide in search of bison. The Shoshone were virtually starving. Despite the attractiveness of the habitat (patches of shrub-steppe on south slopes; conifer forest in ravines and on north slopes; stream-laced alluvial meadows, now grazed by livestock), game was scarce and the party began to consume its emergency supply of dry soup and corn meal. To survive the scarcity of wild game in the Bitterroot Mountains, they killed colts and a horse.

In the Columbia drainage east of the Bitterroots and west to the Cascades, game remained scarce. Although their hunters killed a few deer in the dry hills above the Clearwater River, the animals were wary and hard to approach. During the 50 days the Corps of Discovery camped on and canoed down the Clearwater, the Snake, and the Columbia rivers to the Cascade Mountains, roughly equivalent to their distance of travel on the Upper Missouri (Fig. 1), they killed only 28 deer (Table 2), half on the upper Clearwater and the rest over 300 km to the west in woodlands above the Dalles. Limited to deer, their total take of big game averaged 0.15 ration

units a day, less than one-fifth of their desirable daily ration and an order of magnitude less than their 50-day bag on the Upper Missouri (Table 2). For 25 days beginning on 30 September they obtained no big game at all.

In most of Montana game was abundant except in the Badlands, and the explorers encountered no people. In contrast, west of the Bitterroots they were seldom out of sight of native people and camped with or near them every night. Until they reached the Cascades they found too little game to live off the land by hunting. On the lower Snake and Columbia rivers they counted large numbers of drying racks for salmon and passed many lodges and houses. Driftwood for fuel was so scarce that on occasion they had to buy it. The groups they met or learned of in the Columbia drainage included Shoshone, Flathead, Nez Perce, Palus, Wanapam, Cayuse, Umatilla, Okanogan, Yakama, Clatsop, and other Chinookans—in aggregate a total population they estimated at 80,000 (Moulton, volume 7).

Unable to stomach the standard native diet of "roots" (tubers, bulbs, and other storage organs of over a dozen species; see Hunn 1990) and dry fish, and unable to find enough game in the vast game sink of the Columbia Basin, it is not surprising that the Corps of Discovery, followed by the Astorians and other fur traders, turned for survival to the domestic animals of the local people. The captains bought and ate many dogs and a few horses, the former at bargain prices. They and their men pur-

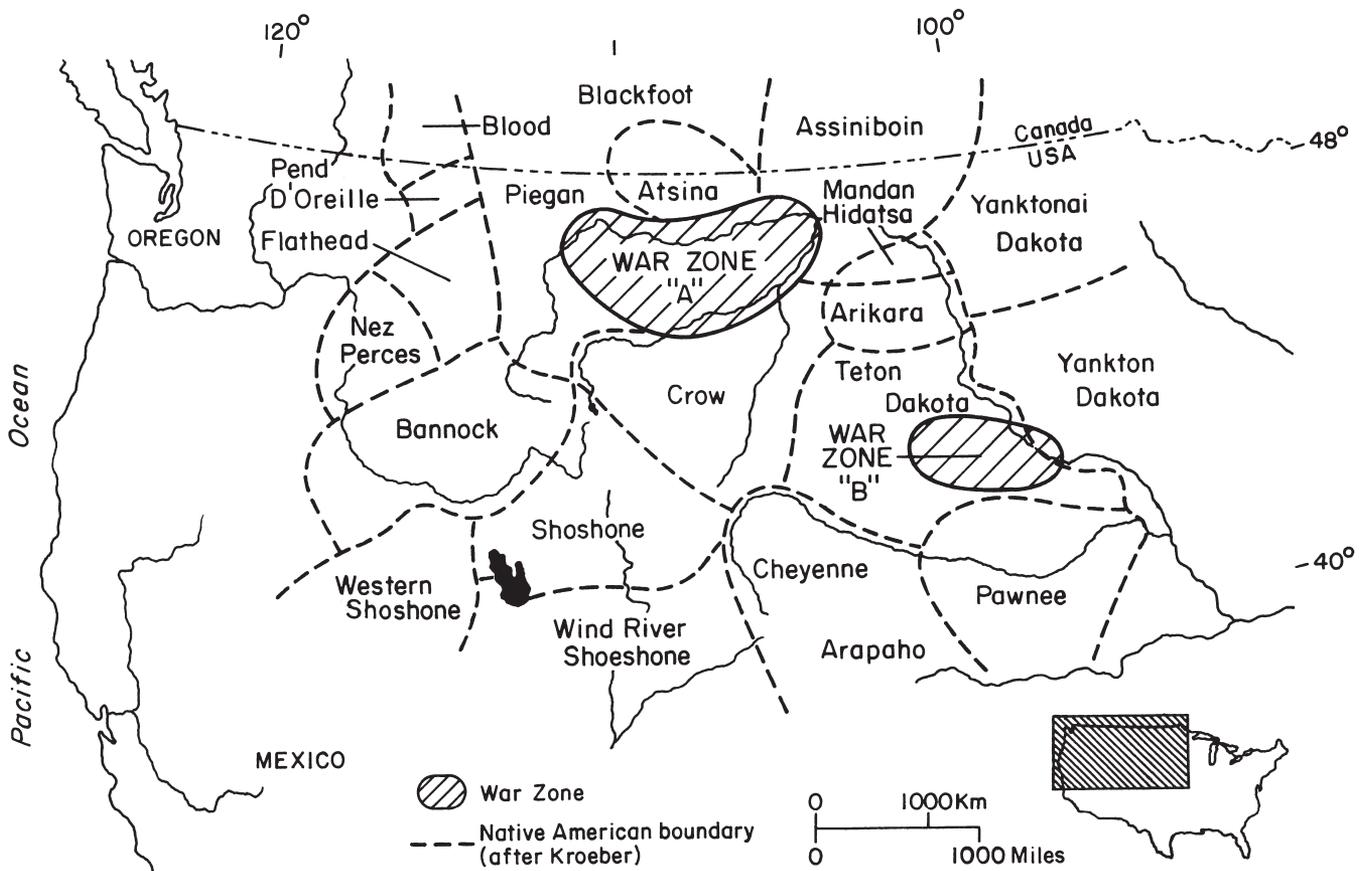


Figure 2. Distribution of Plains Indians and their neighbors around the Upper Missouri war zone from the mouth of the Yellowstone to Great Falls (war zone A) and between the White and Niobrara rivers (war zone B); map modified from Wisbart 1979.

chased over 100 dogs on their journey west and at least 80 on their return (Table 2). The fur traders that followed bought and ate large numbers of both dogs and horses.

Horses were the only large herbivores that were more numerous along the Columbia than along the Upper Missouri River. Horses, introduced by the Spaniards, reached the Columbia Plateau roughly a century before Lewis and Clark (Moulton, volume 7). In the absence of wild game, horses became a major source of meat for the fur traders, starting with the Astorians (W. P. Hunt in Rollins 1995). In his 1825 tour of inspection, Hudson's Bay Company Governor George Simpson discovered that to provision Fort Nez Perce located near the mouth of the Snake (Fig. 1), the resident fur traders had bought and slaughtered some 700 horses over the previous 3 years (Merk 1968).

Despite the lack of game, Lewis and Clark appreciated the potential productivity of the rich loess soils in parts of eastern Washington and western Idaho. The land supported large numbers of free-ranging Indian horses, "many as fat as seals" (Lewis, 25 April 1806). "These people have immense numbers [of horses]; one individ-

ual might own 50 to 100 head" (Lewis, 13 May). Projecting the lower of these numbers on a possible regional population of at least 1,000 and at most 10,000 Indian riders, we estimate a total of between 50,000 and 500,000 horses in the Columbia Basin.

With all members of the party riding horses along the Touchet River in present-day Walla Walla County, Washington, Lewis (1 May) saw "... very little difference between the apparent face of the country here and that of the plains of the Missouri only that these are not enlivened by the vast herds of buffalo Elk etc. which ornament the other." It was spring in "a beautiful fertile and picturesque country. . . . the soil is a dark rich loam thickly covered with grass and herbaceous plants which afford a delightful pasture for horses" (Lewis, 7 May). If the pasture was so delightful for horses, why were there no bison or elk and not even many pronghorn or deer?

Game Sinks, Game Irruptions

Curiously, within two decades of the time of Lewis and Clark and the Astorians, including Hunt and Stuart (Roll-

ins 1995), the range not only of bison but also of hunting parties of Blackfeet spread west across Lemhi and adjacent passes into eastern Idaho as far as Twin Falls. In the 1820s, various fur brigades led by Ogden (Rich & Johnson 1950) and Bonneville (Irving 1977) shot bison on both sides of Lemhi Pass. Ross (1956) estimated 10,000 bison in one valley west of Lemhi Pass. Into the 1830s, large numbers of bison induced both trappers and Indians to winter in southeastern Idaho and northern Utah. Lack of bison west of Twin Falls baffled brigade leader Peter Skene Ogden (Rich & Johnson 1950). The range shift refutes the view that low overall forage production accounts for prior scarcity or absence of bison west of the Rockies.

If *Bos* is a surrogate for *Bison*, the astonishing growth of the cattle industry in the Northwest from 1855 to 1885 under year-round grazing without supplementation "is proof that the quality of forage in the Columbia Plateau was more than adequate [for bison] at all seasons" (Urness 1989). This, along with the success of free-ranging bison on Antelope Island in Great Salt Lake, in the Henry Mountains of southern Utah, and elsewhere west of their historic range, led Urness to conclude that "bison could do very well in the grasslands and sagebrush grass steppe throughout the Far West."

Although bones of bison, bighorn, or deer were usually more common than those of elk in zooarchaeological sites, Dixon and Lyman (1996) and McCorquodale (1985) concluded that for thousands of years prehistoric people hunted elk, at least occasionally, within treeless shrub steppe of the Columbia Basin. Adjoining forested regions harbored elk early in the nineteenth century. For example, Lewis and Clark survived on elk when they wintered in heavy forest at Astoria (Table 2), Stuart (Rollins 1995) and others found evidence of elk in the Blue Mountains of eastern Oregon, and elk could be expected in any forested part of the Columbia River drainage. Nevertheless, none of the historic journals we have consulted mention elk herds in Great Basin shrub-steppe.

To advance the argument that the bunch grass and sagebrush communities of the Columbia Plateau could have supported elk, we consider the case of Hanford in central Washington (<20 cm mean annual precipitation). Over 500 elk now thrive in a 340-km² enclosure of shrub-steppe at the Arid Lands Ecology Reserve at Hanford, northwest of Richland, Washington (Eberhardt et al. 1996). Despite aridity, the treeless shrub-steppe found at Hanford is as productive in elk forage as the pine and cedar-hemlock forest and mountain meadows (McCorquodale 1991), supposedly preferred by elk. For the Hanford elk "nearly twenty years of trend data on the population yielded an overall rate of increase of 20% per year" (Eberhardt et al. 1996). This is close to the maximum (intrinsic) rate of increase for the species.

A similar irruption of protected elk recently occurred in Great Basin sagebrush-steppe at the Idaho National

Engineering Laboratory (INEL) reserve outside Idaho Falls (S. Miller, personal communication). The recent irruptions as well as Lewis and Clark's observations of elk in open plains of the Upper Missouri indicate that *unhunted* elk can thrive in open country. The irruption of elk in Columbia Basin shrub-steppe, as at Hanford and the INEL, refutes the explanation of unfavorable habitat (including the absence of tree cover) as the reason for lack of elk along the Columbia in early times. Possibly, the grazing impact of free-ranging horses 200 years ago could have reduced carrying capacity for elk in shrub-steppe.

Historic journals and other documents indicate that the Columbia Basin was a sink for all megafauna except the horses of the natives. We propose that the human population along the Columbia, supported by fish and foraging, seized every opportunity to hunt wild game. In winter on snowshoes and at any season on horseback, using drive lines, dogs, and fire, the hunters exerted considerable pressure on populations of wild game.

War Zones, Warriors, and Wildlife

In the 1750s, trade goods from fur trading companies—including guns, knives, and ammunition—began to spread southwest from forts on Hudson's Bay and on the Great Lakes. The trade armed the Chipewyan, Cree, Assiniboin, and eventually more distant groups, including the Atsina and the Blackfeet. Finding themselves supplied with more and better weapons than their adversaries to the west, "three Blackfeet tribes (Piegan, Blood, and North Blackfeet) and their culturally related allies (Gros Ventre [Atsina] and Sorsi) laid claim to a vast area of grassland immediately east of the Rocky Mountains extending from the North Saskatchewan River in present Alberta southward to present Yellowstone Park and eastward to the mouth of the Milk River on the Missouri" (Ewers 1968; Clark, 12 May 1806). In fierce nomadic raids the Blackfeet and their allies drove out Kootenai, Flathead, Nez Perce, Shoshone, and other tribes located to the west of the bison range (Joseph 1965). Blackfeet and their allies also killed many trappers, including those lost in the Immell-Jones massacre of 1823 that terminated efforts of the Missouri Fur Company to trap the rich beaver streams around Three Forks, Montana (Wishart 1979).

From years of experience trading with the Blackfeet, Henry (Coues 1897) wrote: "War seems to be the Piegan's sole delight; their discourse always turns upon the subject; one war-party no sooner arrives than another sets off . . . horses are their principal plunder . . . they are always the aggressors." Anthropologist Ewers concluded that, "It is doubtful that any other western tribes were so genuinely feared by so many other tribes as were the Blackfeet in the middle of the nineteenth cen-

tury. The Assiniboin, the western bands of Crees, the Crows, Shoshonies, Flatheads, Pend d'Oreilles, and Kootenais all looked upon them as their greatest enemies" (Ewers 1958).

Although early observers west of the Rockies and east of the Cascades found scant populations of big game, at least along inhabited river corridors and trade routes, the uninhabited river corridors east of the Rockies supported sizable game populations. On 29 August 1806, near the confluence of the White River with the Missouri River, when Lewis was recovering from a bullet wound, William Clark viewed ". . . a greater number of buffalo [he estimated 20,000] than I have ever seen before at one time." Here 2 years earlier Lewis had reported vast herds of bison, deer, elk, and pronghorn as far as the eye could see (16 September 1804). Clark's next words come as close as any to explaining the remarkable shift in game numbers the Corps of Discovery had seen during its explorations. For this reason alone they deserve emphasis: *"I have observed that in the country between the nations which are at war with each other the greatest numbers of wild animals are to be found."* Although the nations in this case are not named, they probably include neighbors of the Teton Sioux, the Yankton Sioux, Arikara, Crow, and Pawnee (Fig. 2).

Over 60 years later another army officer, Richard Dodge (1959), continued in the same vein. He reported that the Sioux, displaced west of the Missouri, found themselves between their traditional foes the Crow and the Pawnee. The country between the Niobrara and White rivers "became a debatable ground into which none but war parties ever penetrated. Hunted more or less by the surrounding tribes, immense numbers of buffalo took refuge . . . where they were comparatively unmolested remaining there summer and winter in security."

Apparently without knowing it, Dodge advanced the same explanation to account for the same phenomenon in the same general region as Clark. Various other early western travelers have reported other buffer zones (Table 3). In 1839 the Indians living by bison hunting "recognize certain districts, where buffalo usually abound, as common hunting and war ground, where various tribes roam at will, subjecting their conflicting rights to the test of strength. Between the tribes there is perpetual warfare" (Wislizenius 1969).

Returning from California in 1844 to the "first glad view" of buffalo near South Pass, Wyoming, Fremont found the country richer in game than any part of the Rocky Mountains he had visited. "Its abundance is owing to the excellent pasturage, and its dangerous character as a war ground" (Jackson & Spence 1970).

A shift in bison range eastward out of Colorado between 1830 and 1840-1860 is mapped by West (1995). Bison herds endured in the neutral ground between Lakotas, Cheyennes, Arapahoes, Comanches, and Kiowas on the west and Pawnees, Otoes, and Osages on the east. In a sense, peace between Comanches and Kiowas and their Cheyenne and Arapaho rivals killed the bison in Colorado (Flores 1991; West 1995). War zones were negotiable.

An early recognition of intertribal no-man's-lands dates back to the time of Champlain in 1609, even before the warring parties had obtained guns. Entering Lake Champlain from the Richelieu River in July, Samuel de Champlain found himself in the uninhabited war zone between Iroquois (Mohawks) and Algonkians (Montagnais). On islands he found many "animals to hunt, such as stags, fallow deer, fauns, roebucks, bears, and other kinds of animals . . . we caught a great many of them" (Biggar 1925, volume 2). In 1622 when the Mohawk showed up at

Table 3. Animals of game-rich war or buffer zones (few or no permanent inhabitants).

<i>Location</i>	<i>Animals</i>	<i>Disputants</i>	<i>Date</i>	<i>Source</i>
Lake Champlain	deer	Iroquois, Algonkians	1609-1628	Biggar 1925 Henry in
Red River of the North	bison, elk, bear	Chippewa, Sioux	1800-1808	Coues 1897 Hickerson
Wisconsin, Minnesota Between White and Niobrara rivers, South Dakota	deer, elk bison, elk, deer	Chippewa, Sioux Teton Dakota, Yankton Dakota, Pawnee (war zone B in Fig. 2)	1700-1850 1806, 1870	1965, 1970 W. Clark in Dodge 1959
Eastern Colorado	bison	Arapaho, Cheyenne, Comanche, Kiowa, Pawnee, Osage, Otoe	1820, 1840	Flores 1991; West 1995
Powder River, Montana	bison	Sioux, Crow	1859	Raynolds in Kay 1995
Upper Missouri, Yellowstone rivers, Montana	bison, elk, deer, bear, pronghorn	Assiniboin, Atsina, Nez Perce, Crow, Flatheads, Shoshone, Piegan, others (war zone A in Fig. 2)	1800-1840	Martin & Szuter (this paper)
Upper Amazon River, Brazil	forest game	various forest tribes	prehistoric to 1700s	DeBoer 1981
Korean Demilitarized Zone	cranes, other wildlife	North Korea, South Korea	1950s to present	Higuchi et al. 1996; Kim 1997

Three Rivers proposing peace, one reason Champlain favored such a policy was that it would enable both the Algonkians and the Iroquois to hunt in the vast no-man's-lands that lay between them. It is hardly surprising that sizable buffer zones reported in the sixteenth and seventeenth centuries can be traced into the prehistoric past, as in the Upper Amazon in South America (DeBoer 1981).

War zones have their modern equivalent in, for example, the 4×250 -km demilitarized zone (DMZ) across the Korean Peninsula that separates North and South Korea (Kim 1997). All human activity is prohibited and the zone is mined. A variety of landforms and climatic zones with a protected fauna make the DMZ an ideal nature reserve (Kim 1997). For example, between wintering grounds in southern Japan and breeding grounds in northeastern China, migrating White-naped Cranes (*Grus vipio*) spend 87% of their time in the DMZ (Higuchi et al. 1996). Red-crowned Cranes find refuge there as well.

Conclusions

Although the journals of their explorations are rich in environmental information about the West of two centuries ago, Lewis and Clark arrived 12,800 years too late to find mammoths, camels, horses, short-faced bears, and three dozen other large native species of the Late Quaternary megafauna (Table 1). They did witness some of the post-contact turbulence that transformed or, in some cases, destroyed American Indian tribes.

Despite handicaps in perspective, Lewis and Clark did not regard abundant game as necessarily "natural." According to Clark the greatest number of large animals that the party saw occurred in regions between nations at war. Our review indicates that, early in the nineteenth century along the Missouri and Yellowstone rivers in what would become the state of Montana, Lewis and Clark penetrated a major war or buffer zone involving at least eight different tribes. War parties penetrated but did not occupy 120,000 km² (Fig. 2) richly stocked in bison, deer, elk, and other game. Lewis and Clark reported that the large animals were often approachable and fearless. The area was somewhat larger than the war or buffer zone sheltering deer that Hickerson (1965, 1970) documented in the Midwest between the Chippewa and the Sioux. In the Upper Missouri region the Assiniboin, Apsinon, Blackfeet, Crow, Hidatsa, and Sioux obtained guns from British and American traders. Coming east across the Rockies to hunt bison, Kootenai, Flathead, Nez Perce, and Shoshone risked decimation by war parties of their better-armed neighbors. In the tension zone, bison and other big game flourished.

Familiar to ethnohistorians, war zones may prove of equal interest to conservation biologists. War zones should be considered in any historic explanation of

abundant megafauna (Table 3; Flores 1991; Kay 1994, 1997). Although abundance of an un hunted megafauna and absence of resident hunters may appear to be the natural condition, it may in fact constitute a buffer or war zone under significant cultural influence.

West of the Rockies, Lewis and Clark found a major drop in the numbers of large animals. There the Kootenai, Flatheads, Nez Perce, Cayuse, Shoshone, and others living on roots and fish maintained free-ranging horses in a sink for native megaherbivores. The argument that scarcity of elk, deer, and other game reflects low carrying capacity for megaherbivores in the Columbia Basin is vitiated by (1) the large numbers and good condition of free-ranging Indian horses reported by Lewis and Clark, (2) the highly favorable comments on quality of the land in Lewis and Clark's journals, (3) the rapid growth of the livestock industry beginning in the 1850s, and (4) the current irruption of un hunted herds of elk in protected military reserves, indicating that if un hunted and unsettled, even the most arid parts of the intermontane states can support more game than reported in the first documents.

According to Urness (1989), in the absence of settlement the Far West would be suitable for bison. The journals of Lewis and Clark suggest that activities of American Indians regulated the range and numbers of large animals well before any overhunting by Europeans. As Kay (1994) has shown, people of any ethnicity are capable of suppressing wildlife.

We find that neither historic scarcity of big game in the Columbia Basin nor historic abundance in the Upper Missouri region is truly natural, that is, falling outside human influence or control. War zones or neutral zones suggest what communities of large animals might be like in the absence of appreciable human predation. The war zone model supports the managerial option of allowing large numbers of large animals to occupy public lands, whether or not large numbers occurred in the region in historic time. Nevertheless, the West in the time of Lewis and Clark was long past any purely "natural" condition that might serve as an absolute benchmark for planners. That condition vanished with the mammoths and other megafauna over 10,000 years ago (Table 1).

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