Plains Bison

Mysteries That Remain
Part I: The Buffalo Population and Why It Crashed

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Volumes have been written about buffalo. Most emphasis has been placed on the historic period, immediately after the use of the Vore Buffalo Jump stopped (about 1800) through the era of Anglo-American expansion into the Plains to the near-extinction of bison some 80 years later. However, with two centuries of written records and millions of visual images, there are still basic facts, especially about the pre-1800 bison herds and their interaction with humans and livestock, that are not fully understood or agreed to.

Some Points of Contention

Issues that experts disagree on include the total population of buffalo that lived on the Great Plains at any one time. There are arguments as to whether, or to what extent, Indian hunters affected bison populations and movements. There are controversies related to the interaction of bison and domestic animals brought into the Western Hemisphere from other continents, especially where disease is concerned. There is even some controversy as to whether bison migrated in any discernable pattern. This is the first in a series of articles that will ask, and hopefully, answer some key questions about buffalo.

How Many Buffalo Were There?

Estimates of bison numbers vary from 30 to 75 million. 50,000,000 to 60,000,000 are the most common numbers cited as total buffalo population in the early 1800's. The variability in estimates is enormous, but it's a basic principle of ecology that populations of wild animals are never static. They fluctuate up and down in response to many factors, including the availability of food, water, other habitat attributes, predation, disease, reproductive performance, climate and so on. Prolonged droughts were probably chief among the natural environmental threats, but extreme blizzards, fire and drowning sometimes killed large numbers of buffalo.

Obviously, nobody in the 19th Century had the capacity or responsibility of conducting a census of the entire Great Plains bison population. Best estimates are based on knowledge of ecology, supplemented with reports and journals written before catastrophic destruction of the great herds began. However, even the most reputable observer was seeing only a small part of a vast area with correspondingly huge populations of animals.

For example, in 1871 Colonel R.I. Dodge passed through a buffalo herd that he and his hunters believed was 50 miles long and 25 miles across. Dodge estimated a density of 15 to 20 bison per acre in the herd. Using the lower number (15 bison/acre) times a rectangle 25 X 50 miles would result in an estimate of 12 million buffalo in a single herd! William Hornaday, writing in 1889, reduced the estimate of the herd Dodge described to 4 million animals. In 1970, F. Roe reworked the numbers from both Hornaday and Dodge, concluding that Hornaday had underestimated the herd size.

There are many similar accounts from 19th Century travelers, explorers, soldiers and emigrants. However, they all suffer from the same basic problem… sampling error. One-time observations of a tiny portion of a vast area populated by huge numbers of animals that were mobile and not uniformly distributed are simply not valid. **(Continued next page)**

Hornaday and others also tried to use records of buffalo-related commerce to estimate bison populations. While they seem more objectively quantitative, these methods also have serious limitations. Fur trading companies document that the buffalo robe trade expanded dramatically as the beaver fur trade declined. Fur companies shipped an average of 130,000 robes per year through New Orleans between 1825 and 1830.

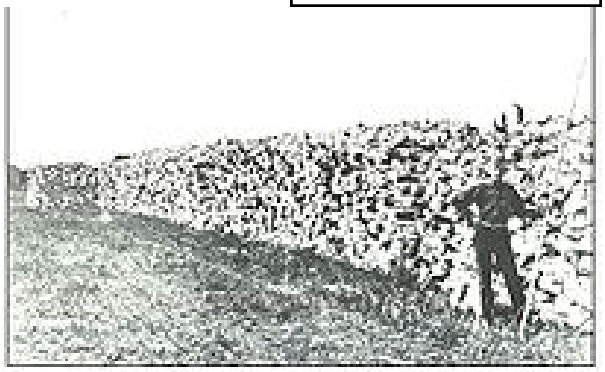
After the Civil War, industrial demand for hides was in the millions per year and official government policy was to remove Indians from the Plains and open the area to agriculture. Policy required elimination of the buffalo. Industrialization provided additional incentives. Railroads made it easier.

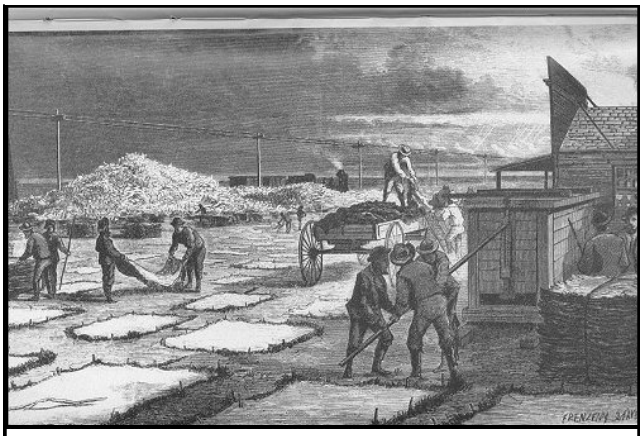
There are some records of the number of buffalo hides and bones the three main railroads transported during the great post-Civil War slaughter. These inventories are incomplete and extrapolation from them is imperfect, however the numbers are staggering. **Estimates are that 31,000,000 buffalo were killed and transported by rail for bone and hide between 1868 and 1881!** That does not include much greater numbers that died from hunting, disease or other causes but were not salvaged or transported. By the late-1880's the American buffalo was facing extinction.

Ecological Estimates

The naturalist, Ernest Thompson Seaton was the first person to base an estimate of bison population on the carrying capacity of native range. Seaton started with a 1910 USDA **(Continued)**

Buffalo bones were shipped east by the train load where most of them were ground and used for fertilizer. They also found use as a refining agent in the processing of sugar and in production of fine bone china.





Lithograph of men curing buffalo hides and stacking bones prior to transport—Dodge City, KS 1873

A buffalo "hide yard" in Dodge City , KS in 1874 — A major use of leather from buffalo hides was to make belts for the industrial machines that proliferated in the mid-1800's. Entire forests of tannin-rich hemlock trees were logged in New York and Pennsylvania to provide the chemicals for this tanning and major rivers were massively polluted by wastes from the process.

A pyramid of bison skulls and other bones at the Michigan Carbon Works in Detroit.

census of domestic livestock. The USDA reported 24 million cattle and horses and 6 million sheep on what Seaton estimated was half of the bison range on the Plains. He doubled those values and compensated for other wild grazers (ex. elk) to conclude that the Plains could have supported 40 million buffalo. Seaton then added the numbers he thought could be supported by the Tallgrass prairies and the wooded regions, 30 million and 5 million respectively, to arrive at an estimated carrying capacity of 75 million buffalo for North America. Seaton later revised this estimate down to 60 million.

At least two others have published bison population estimates using the carrying capacity concept. Dan Flores (1991) used the same 1910 USDA statistics supplemented with county reports to estimate that the entire Plains region could support 28-30 million buffalo.

A rangeland scientist (McHugh, 1972) concluded that the average carrying capacity for western prairies was 26 bison/square mile. Using that figure, the area would have supported roughly 30 million bison. Thus, McHugh, Flores and the 1910 USDA census came to about the same estimate, 30 million or so, the lower end of the range of population estimates.

An M.S. degree in Range Science and a bunch of additional training in ecology lead this writer (Gene Gade) to bias in favor of the carrying capacity approach and more conservative estimates of bison population...i.e.30 to 40 million.

Multiple Causes of the Bison "Crash"

It's very well documented that over-hunting was a dominant factor in the near-extinction of the buffalo. However, massive outright slaughter was not the only cause. Disease and drought also contributed to the catastrophe.

At the end, even the hunting exploitation was not quite as simple as it is commonly portrayed. Up through the period of Vore site use (i.e., prior to 1800 A.D.), Plains Indians hunting was only for subsistence. Archaeological evidence from the Vore site and elsewhere indicates that bison kills were completely butchered and processed. There was minimal waste.

However, as the fur trade involving companies from the United States and Britain expanded into the West after 1800 and as Indians in the region acquired horses and improved weapons, the tribes were increasingly involved in the "robe trade"...trading buffalo robes for manufactured trade items. Demand was high for metal items, such as cooking pots, eating utensils, knives, guns, (even metal arrow points), as well as cloth, glass, tobacco, sugar and flour. It was a classic case of rising material expectations. Especially as the supply of and demand for beaver pelts declined in around 1830, buffalo robes, hunted

Meriwether Lewis writes about a buffalo herd he observed:

"These last animals [the buffalo] are now so numerous that from an eminence we discovered more than we had ever seen before, at one time; and if it be not impossible to calculate the moving multitude, which darkened the whole plains, we are convinced that twenty thousand would be no exaggerated number." August 29, 1806

hunted by male Indians and tanned by Indian women, became the "currency" of trade.

American companies competed for this trade, building trading posts along major river drainages. Bent's Fort on the Arkansas River, Forts St. Vrain and Laramie, on the South and North Platte Rivers, respectively, Fort Union at the confluence of the Missouri and Yellowstone Rivers and others were deeply involved in this robe-driven commerce. In Canada, the Hudson Bay and Northwest companies played a similar role, especially after they merged in 1821. Partly as a result of the robe trade, the number of buffalo killed by Indians increased dramatically in the half century right before the bison population crashed and the "Indian Wars" ended the era.

New Diseases

The story of how infectious diseases brought to North America by Europeans...small pox, cholera, diphtheria, measles, influenza and others… decimated human populations of Native Americans is reasonably well known. The impact of animal diseases introduced to this continent from Europe and elsewhere is less well known, but very significant. Buffalo were victims of the new microbes. Among the exotic disease that now infect buffalo are brucellosis, anthrax, bovine tuberculosis and Texas fever (a tick-vectored cattle disease). Anthrax and tuberculosis cause respiratory and other problems. Texas fever attacks red blood cells. Brucellosis has many possible symptoms and potentially infects many mammals (including humans), but the most concerning is that it causes cattle and bison to abort fetuses.

Exactly when these diseases were transferred to buffalo and how much they affected the bison decline in the 1800's is a matter of dispute. However, it's fairly clear that these diseases were initially transferred to bison (and sometimes other ungulates, such as elk) from domestic livestock and that they were an added threat to a buffalo population already under great stress.

It is ironic that brucellosis has been largely eliminated from domestic livestock in the U.S. However, wild bison and elk in Yellowstone National Park and other locations have become a reservoir of the disease and a continuing threat to re-infect cattle herds when they intermingle, primarily on public lands, or when wild populations drift to lower elevation lands, usually privately owned, for the winter. Brucellosis-free status is of enormous economic importance to cattle ranchers, not only because it affects the reproductive performance of their herds, but because cattle cannot be marketed from infected areas. The cost of controlling and monitoring brucellosis is also very high.

As a consequence, some people propose elimination or dramatic reduction of bison and elk populations in Yellowstone and other infected areas. The State government and University of Wyoming, along with many other government agencies and interest groups are passionately concerned about management issues related to brucellosis, buffalo, other wild ungulates and cattle. The issues defy simplistic solutions and will probably be with us for some time.

Climate Factors?

The genus *Bison* has been in North America for more than a million years and the modern species has been here at least since the most recent glacial period (10,000+). During that tenure, the climate has made a number of major fluctuations and bison populations have gone up and down in response. For example, there was a prolonged warm, dry period in the mid-Holocene 8,000 to 5,000 years B.P. (B.P.="Before Present"). During this so-called "Altithermal," bison populations declined markedly and may have been absent from parts of the Great Plains. The larger species, *Bison occidentalis,* became extinct near the end of this prolonged drought as a savanna-like ecosystem evolved into the semi-arid grasslands of today. The smaller, modern buffalo expanded into the niche and prospered, becoming the vast herds that Plains Indians built their cultures around and that so astounded European-Americans observers.

Recent studies have documented a sustained drought on the Great Plains from 1845 to 1856. Over the millennia, buffalo clearly survived many droughts that were more severe and of much longer duration than the one in the mid-1800s. However, the combination of this drought with other stressors probably magnified its impact on bison populations.

Drought always reduces the amount of forage available to grazing animals on the uplands. In earlier times buffalo probably relied heavily on the river corridors as winter habitat and as a refuge during dry periods. It's probable that, during droughts, some herds also wandered toward greener pastures in high precipitation zones farther east.

As permanent settlements and cultivated agriculture nibbled at the edges of bison territory, such safety-valve migrations would have been restricted.

Also, as several authors have noted, *"beginning in the early 1840's, large caravans of both U.S. Army and Euro-American settlers, with thousands of horses and other livestock, traveled these corridors, severely reducing both forage and woodlands. At the same time, the Native American populations of the western Great Plains, many of whom were relatively newcomers to this area, with their numerous horse herds, were increasing their usage of these same riparian corridors in response to the regional bison hide market created by newly established trading posts along the rivers. As a result, bison would have found much poorer conditions for subsistence during a period when these riparian areas would have been most critical."* (Woodhouse et al. 2002, West 1995, Flores 1991, Isenberg 2000). There is also record of an "epic" blizzard that caused the death of many buffalo in 1844.

What may have made this blizzard and the 1845-1856 drought significant is that they combined with other factors… dramatically increased hunting… mortality and reproductive problems associated with new diseases...habitat loss or alteration….to accelerate the demise of the great bison herds. When a species is teetering on the edge of the extinction abyss, it takes little to tip the balance.

All of these interacting factors are acknowledged by Andrew Isenberg in his book, *The Destruction of the Bison.* However, Isenberg points out that people were well aware of the buffalo's decline decades before the final crash. It was not an accident. It was a matter of conscious public policy and was celebrated by many. Writes Isenberg, *"...Euroamericans did not slaughter millions of bison between 1870 and 1883 believing that nature provided an inexhaustible supply. Rather, they anticipated the extinction of the species. They regarded the disappearance of the herds as a triumph of civilization over savagery, because extermination of the bison removed the nomads' primary resource and cleared the plains for Euroamericans. Hide hunters harbored little apprehension that the late nineteenth-century legal order might rein in the slaughter. Legal and extra-legal authorities in the nineteenth-century United States were the partisans of Euroamericans in their struggle to wrest control of resources from the Indians….A few lawmakers saw the destruction as deplorable—a violation of the treaties, a provocation to Indian war, a profligate waste—but others saw it as a salient example of Euroamerican industriousness. The plains remained a wilderness while in Indian hands, but hide hunters extracted extraordinary wealth from the grasslands—even if most of them failed to keep that wealth for themselves."*

The Aftermath

By the end of the 1880's, only a few hundred bison remained, most of them in Yellowstone. A few vocal advocates of buffalo argued for their preservation and for establishment of additional refuges for them. Societal attitudes and government policy shifted in that direction during the 1890's and early 20th Century. Several private ranchers were instrumental in developing large herds from a few stragglers.

Today, there are many state, provincial and national parks in both the U.S. and Canada that have bison herds of varying sizes. Even more animals are raised on commercial buffalo ranches. The North American buffalo population is now at least 350,000 and growing. However, while the bison has certainly made a comeback and is probably no longer in imminent danger of extinction, the current number is still little more than 1% of the most conservative estimates of early 19th Century populations.

The rescue of bison from near-extinction is considered by many people to be one of the great conservation success stories in history. It probably is, but it's also a cautionary tale. This great nation came within a hair's breadth of deliberately destroying a natural wonder that amazed virtually everyone who witnessed it.

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