

IS THERE A FUTURE FOR THE GRAY WOLF IN THE GREAT PLAINS?

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ABSTRACT — Prior to European settlement, the gray wolf (*Canis lupus*) may have reached its greatest densities in the Great Plains, due in large part to the plenteous prey biomass. The last Plains wolves were extirpated in the 1920-30s. Wolf restoration in the Great Plains is unlikely in the near future; however, the long-term prospect is more optimistic. People have been depopulating the rural Great Plains since early in the twentieth-century. Two hundred and twenty-five counties now have less than 2.3 people per km², and 67 counties have less than 0.8 people per km². Government forecasts project continuing depopulation in rural areas for at least the next several decades. Agriculture, the traditional mainstay of the region's economy, and the predominate land use, continues to decline. Several authors have noted the singular opportunities for wildlife conservation in the region, the most famous of which is the Buffalo Commons proposal of Frank and Deborah Popper. The 73,400 km² of public land in the region provide a seed source for wolf restoration; however the lands are highly fragmented and compromised by commercial interests (e.g., livestock grazing). The return of the wolf presupposes the formation of large contiguous tracts of public land and the return of large, wide-ranging populations of bison (*Bison bison*).

BACKGROUND

The wolf (*Canis lupus*) that inhabited the Great Plains was known by several names including buffalo wolf, Plains wolf, loafer and lobo. Early taxonomists listed as many as three species of Great Plains wolves (based mainly on pelage), plus the coyote (*Canis latrans*: frequently called the prairie wolf or North American jackal). Later works reduced the Great Plains wolf to a single endemic subspecies, *Canis lupus nubilus*; however, even more recent work by Nowak (1995) suggests that most Great Plains wolves were simply a continuum of the subspecies *C. l. nubilus* that extended from northeastern Canada to the western United States, with wolves from the northern Plains being part of another subspecies, *C. l. occidentalis*, that extends to Alaska.

Although Great Plains wolves were apparently taxonomically indistinct from wolves in other ecosystems, they were apparently behaviorally different. For example, Great Plains wolves appear to have traveled in large packs. The nineteenth-century explorer George Catlin (1973) reported that Great Plains wolves could be found in "gangs or families of fifty or sixty in numbers" while the wolf-trapper James Mead (1986) counted 40 wolves in one "string." Great Plains wolves may also have been more nomadic than wolves from other ecosystems, often following the great herds of bison (*Bison bison*). Consider the words of Mead who reported of "killing the big gray wolves which lived with the buffalo and traveled with them, also the coyotes, which were numerous and seemed to live in the vicinity, not following the buffalo in their migrations as the gray wolves did."

Another interesting question is how abundant were wolves in the pre-Columbian grassland biome? The biologist Vernon Bailey (1926) reported that the wolf was historically found in almost every habitat in North America, but "nowhere more numerous than over the Plains in the days of the great buffalo herds." Likewise, John James Audubon (1897) wrote from the Missouri River region of western North Dakota/eastern Montana, "if ever there was a country where Wolves are surpassingly abundant, it is the one we now are in." More quantitative information comes from the wolf trapper Mead (1986) who worked the present day region of Kansas from 1859-75. Mead, traveling on horseback, reported picking up 82 dead wolves in one day that had been killed in two nights with strychnine-laced bison carcasses. At another site Mead and two

trappers, each separated by approximately 7 km, shot several bison which they laced with strychnine; the following day they had 72 wolves and on the day after that they had another 20-30 (Mead often distinguished between the "big gray wolves" and "coyotes", so it doesn't appear that he included coyotes with his wolf kills). So many wolves from such small areas challenges many current assumptions about wolf densities.

So how many wolves were there in the pre-settlement Great Plains? Catlin (1973) implied that there were 1.5 million. He of course did not have the benefit of modern science. Assuming that the 2 million km² of grasslands supported 30 million bison, plus 10 million antelope (*Antilocapra americana*), 2 million deer (*Odocoileus sp.*), 1 million elk (*Cervus elaphus*) and 20,000 bighorn sheep (*Ovis canadensis*), and assuming 1 wolf to 33,750 kg of prey, then there was theoretically enough prey biomass to support 360,000 wolves (Licht in press). Such density greatly exceeds the highest reported long-term wolf densities of 1 per 26 km² and must be viewed with caution. Still, it seems reasonable to conclude that the wolf prospered in the region unlike anywhere else.

It would be an oversight to discuss wolves in the pre-settlement Great Plains without at least briefly discussing their effects on the grassland ecosystem. For example, evidence suggests that coyotes, although present in the southern and central Plains prior to European-settlement, were rare or absent throughout much of the northern Plains. Modern science has found evidence that the presence of wolves may limit the number of coyotes. The relationship could be especially acute in an open landscape, and even more so where food resources are limited, such as they are in the northern plains during winter. Consequently, species that are harmed by coyotes, e.g., black-footed ferret (*Mustela nigripes*), ferruginous hawk (*Buteo regalis*: a ground-nester) and swift fox (*Vulpes velox*), would prosper under the wolf's protective umbrella. All of these species are now struggling for survival in the current wolfless grassland ecosystem.

PRESENT

Although resident wolves have been absent from the Great Plains for at least 50 years, the animal has recently demonstrated a willingness to recolonize the vast grasslands. Licht and Fritts (1994) documented 10 mortalities of wolves in the Dakotas between 1981-92. An eleventh animal was killed in February of 1994.

All but two of the animals in the Licht and Fritts paper were < 2 years old, all but one was killed in winter and all were believed to be traveling alone, suggesting dispersing individuals. The animals most likely came from the forested regions of Minnesota and Manitoba and had apparently traveled at least 46-561 km ($\bar{X} = 297$), most of it across farmland and rangeland. Licht and Fritts reported that the counties where the 10 wolves were killed averaged 57 percent cropland, 36 percent pastureland and 1 percent woodland, demonstrating a willingness by "timber" wolves to venture into, and perhaps recolonize, prairie ecosystems. In addition to the wolf occurrences in the Dakotas, several wolves from the Rocky Mountains have also ventured out into the grasslands of western Montana for brief periods of time.

Concurrent with the increase in Great Plains wolf activity has been a decline in Great Plains human densities and economic activity, especially in the rural regions. Licht (in press) included 625 counties in his delineation of the Great Plains (including tallgrass, mixed-grass and shortgrass prairies). He calculated 7.4 residents per km² in the Great Plains in 1990 compared to 30.0 for the rest of the conterminous United States (based on Census Bureau data). But it was outside the region's metropolitan areas, e.g., Denver, Minneapolis/St. Paul, Omaha, that the sparseness of the region was most striking. Licht found that 228 counties in the grassland biome had a population of less than 2.3 people per km² in 1990, and 68 counties, a 330,000 km² area, had less than 0.8 people per km², the criteria which the 1890 Census Bureau used to identify wilderness. Yet what separates the Great Plains from many other sparsely populated regions is that the sparseness is increasing. While the U.S. population increased 38.7 percent between 1960-90, the 450 least densely populated (i.e., rural) Great Plains counties actually lost 15.7 percent of their population (over 600,000 people). The rate of loss even seems to be accelerating. During 1980-90, 90 percent of the 450 least densely populated counties lost population, compared to only 51 percent in the period 1970-80. Platte County, Wyoming, located in the shortgrass plains, led the nation in population decline between 1980-90 (32 percent). By the year 2010 populations in Iowa, North Dakota and Nebraska are projected to be only 0.81, 0.94 and 0.97, respectively, of what they were in 1980 (Wetrogan 1988). More significantly, most if not all of the depopulation will take place in rural regions.

Why the decline? Traditionally the Great Plains

economy has been dependant on agriculture. But land-saving technological advances in agriculture have made arid Great Plains farmland and rangeland less profitable for the individual owner and less necessary for the nation as a whole. Whereas farmers were producing 37 bushels of wheat and 69 bushels of corn per ha in 1940, they were producing 94 and 291 bushels in 1985, respectively (253 and 421 percent increases). Yet during that same period the U.S. population experienced a comparatively modest 71 percent increase. The result is that the United States (and Canada) found itself with enormous food surpluses and too much land devoted to agriculture. To rectify these problems the federal government has been paying farmers to annually retire tens of millions of hectares of cropland from production. Since 1933 at least a dozen different set-aside programs have been initiated with the last one being the Conservation Reserve Program of 1985 (and due for reauthorization in 1995). Over the past 60 years set-asides have averaged 12 million ha annually, and since 1983 they have averaged closer to 23 million ha annually, with the long-term trend being a 4.2 percent annual increase (Licht in press). Heimlich and Kula (1991) observed that during most years government programs have idled as much as 20 percent of Great Plains cropland. And during years when there was less than 20 percent of the Great Plains cropland in set-aside programs the federal expenditures simply shifted to other subsidies such as deficiency payments.

It appears that the problem of surplus agricultural capacity is only going to get worse. By the end of the twentieth century, wheat, corn and cotton yields are expected to increase an average of 22, 11 and 18 percent respectively per unit area from their 1990 levels (U.S. Office of Technology Assessment 1992). Similarly, livestock commodities are also expected to increase due to science and technology. Meanwhile, the U.S. population is expected to increase only 0.5 percent annually over the next few decades and then level off around the year 2038 (Spencer 1989). Meanwhile, agricultural exports are projected to fall or stagnate as other countries make agricultural advancements. Concurrent with these trends is the likelihood of reduced farm subsidies due to the \$5 trillion federal debt. If subsidies are reduced the impacts will hit hardest in the arid Great Plains. Consider that 76 percent of the farms in Arapahoe County, Colorado, 72 percent of the farms in Ector County, Texas, and 63 percent of the farms in Thomas County, Kansas, had

farm operating expenses that exceeded their gross sales in 1992; in other words, had it not been for government payments, farming in many parts of the arid region would actually lose money. Because of these and other factors, government projections suggest that the amount of cropland and rangeland will decrease over the next several decades, and much of the reduction will occur on marginal lands such as those of the western Great Plains (U.S. Forest Service 1989). The question then becomes, what to do with land freed from traditional commodity uses.

Frank and Deborah Popper state (1987); "we believe that over the next generation the Plains will, as a result of the largest, longest-running agricultural and environmental miscalculation in American history, become almost totally depopulated. At that point a new use for the region will emerge, one that is in fact so old that it predates the American presence." That premise summarizes their controversial prediction, that of the *Buffalo Commons* (Popper and Popper 1994). The Poppers concluded, based on an analysis of economic, demographic and geopolitical trends, that portions of the Great Plains, specifically the region west of the 98th meridian, will convert to a more compatible and environmentally friendly use; the Great Plains would be used as a buffalo commons. The Poppers envisioned 361,400 km² of wildlife refuges in the region, making it the world's largest restoration project (see Matthews 1992).

FUTURE

Although there are vast amounts of public land already in the Great Plains (73,400 km²), the lands are not currently distributed in a fashion conducive to wolf recovery and ecosystem restoration. For example, Licht (in press) calculated that the 14,820 km² of Forest Service administered national grasslands in the region are comprised of 1,298 disjunct tracts and that, based on area-to-perimeter values, the effective area of a typical fragment is only 2.8 km². The largest roadless tract of public land in the Great Plains not used for commercial purposes appears to be a modest 26,000 ha site in Badlands National Park in South Dakota.

Yet for reasons discussed earlier there may be opportunities in the future to consolidate and/or expand public holdings and to dedicate such lands to wildlife conservation. How large such sites would need to be to restore wolves and functioning grassland ecosystems is open for debate; however, Isle Royale

National Park in Lake Superior provides a minimal yet working model. The 2,324 km² forested island - of which only 546 km² is terrestrial - has sustained an average of 20 wolves annually over the past four decades on an ungulate biomass density much less than one would find in a grassland ecosystem. Granted, there may be problems with such small wolf populations, such as inbreeding, but those problems appear manageable and minor when compared to the benefits of restoring wolves to an ecosystem. The professional organization, The Wildlife Society (1991), recognized this possibility when it stated that "if national parks and other protected areas cannot provide large enough areas for self-perpetuating populations of wolves, systematic and periodic reintroduction of wolves from outside may ensure population survival." The same paper stated that populations that are "ecologically functional" may be a more suitable goal in some cases than those that are "minimally viable."

Therefore, it seems reasonable to contemplate the establishment of Isle Royale-like ecological reserves in the grassland biome. Such a thought is less intimidating than it might first seem. The land area of Isle Royale would fit 177 times into the amount of CRP (i.e., excess cropland) in the Great Plains, 27 times in the Forest Service national grasslands, 65 times in the Bureau of Land Management (BLM) land, 12 times in the U.S. Fish and Wildlife Service land and twice in the National Park Service land. Based on these figures, the restoration of wolves to the grassland biome seems like a modest proposal. Indeed, even more ambitious proposals are within the realm of possibility. For sake of argument consider the following. A 6,500 km² reserve could be established in the Badlands region of southwestern South Dakota at a cost of only \$130 million (based on real estate values: Licht in press). Thirty-eight percent of the hypothetical site is already in public ownership with another five percent in federal cropland set-asides. Forty percent of the farms in the region are deficit farms, meaning they may fail in the near future. For a modest investment the nation could restore an ecosystem with perhaps 20,000 bison and 250 wolves, while also reducing farm subsidies. There are numerous other sites in the Great Plains that could be considered, many associated with existing federal lands. Another intriguing possibility is in central Montana where Coffman et al. (1990) proposed that bison be restored to a 39,000 km² site known as the "Big Open." And yet another appealing Montana site is along the Canadian border where Canada has estab-

lished a Grasslands National Park.

Of course, there are significant obstacles to grassland ecosystem restoration. For example, the restoration of the wolf to a grassland ecosystem presupposes the return of large herds of bison. The return of bison may also necessitate the use of fences, creating in effect, an island ecosystem in a sea of commodity uses. Although an abomination to many conservationists, and far from ideal, such measures may be necessary, and would still conserve the functional role of the wolf in the ecosystem.

If ever there was an ideal or preferred ecosystem for wolves in North America, where the species reached its greatest densities and prominence, it was likely the vast grasslands of the Great Plains. The wolf was an integral part of what was once America's Serengeti. Restoring a working semblance of that ecosystem requires restoration of the wolf, for ecologic as well as aesthetic reasons. Along with the bison, the wolf is part of the essence of the grassland ecosystem. Witness the old wolf-trapper Mead (1986) who lamented the wolf's extirpation from the grassland biome; "the most thrilling as well as - to me - the most soul-stirring music I ever heard was the clear deep bass voice of a big gray wolf on a clear cold winter night rolling out over the ice-covered prairie."

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