

Lessons from the Yellowstone Ecosystem: A Critical Evaluation of "Natural Regulation" Management

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When Yellowstone was established as the world's first national park in 1872, the U.S. government felt that there were not enough game animals. So they fed elk and other ungulates, and they killed predatory animals such as wolves and mountain lions. By the 1930's, the U.S. National Park Service (USNPS) had exterminated the wolf from Yellowstone. After a reported massive die-off of elk around 1918, though, concerns grew over elk-induced soil erosion and range damage. The USNPS became convinced that there were now too many elk in Yellowstone, and they tried to reduce the herd by trapping and transplanting elk to areas outside the park. Trapping alone, however, did not reduce the herd to the range's estimated carrying capacity, so park rangers began killing elk in Yellowstone Park. That program was called direct reduction, and from 1949 to 1967, over 13,000 elk were killed in the park. The killing upset many people, who brought pressure to bear on the U.S. government, and politicians threatened to cut off funding to Yellowstone Park if the USNPS did not stop killing elk. This forced the agency to terminate its direct reduction program, and during the late 1960's and early 1970's, the USNPS switched to a program called "natural regulation." Under "natural regulation" management, the USNPS rewrote the history and ecology of elk in Yellowstone.

Before 1968, the USNPS contended that an unnaturally large elk population, which had built up in Yellowstone during the late 1800's and early 1900's, had severely damaged the park's northern winter range, including willow and aspen communities. During this era, the agency believed that: (1) Yellowstone was not a historical elk wintering area, (2) European settlement forced elk to winter in the park, (3) under protection afforded by the park, the elk herd irrupted to over 35,000 animals, (4) those animals proceeded to overgraze the range causing changes in plant species composition and soil erosion, and (5) during the severe winters of the late 1910's, large numbers of elk died of starvation and the population fell precipitously (Houston 1982, Chase 1986, Despain et al. 1986).

In contrast to its earlier interpretations, under "natural regulation" the USNPS now believes that: (1) Yellowstone has always been a historic elk wintering area. (2) European settlement did not force elk to winter in the park. (3) Yellowstone's northern range is close to being an ecologically complete habitat. (4) The park's elk herd never irrupted to over 35,000 animals; earlier government counts of 35,000 elk were wrong. (5) There was no massive starvation and die off of elk during the late 1910's; again early reports to this effect were wrong. (6) Large numbers of elk (12-15,000) have wintered on the northern range for the last several thousand (8-10,000) years. (7) Because large numbers of elk and the park's vegetation co-evolved for a long period of time, elk, vegetation, and other herbivores have been in equilibrium for several thousand years. Any recent (1872-1990) changes in plant species composition are due primarily to suppression of lightning fires, normal plant succession, or

climatic change, not ungulate grazing. Specifically, elk have not caused a decline in tall willow or aspen communities. (8) The park's woody vegetation always exhibited signs of intense browsing and high-lined conifers are natural, not a sign of overgrazing. (9) Elk have not competitively excluded other ungulates such as bighorn sheep, mule deer, white-tailed deer, and antelope, or beaver. Either those populations have not declined since the park was established, or if they have, it was not due to elk. (10) Since predation is an assisting but nonessential adjunct to the regulation of ungulate populations which are resources limited, reintroduction of wolves into Yellowstone would have no effect on the already established elk-vegetation equilibrium. Wolves are not necessary to "control" (limit) elk numbers.

"Natural regulation" is based on the belief that there is a balance of nature (Kay 1990). Under "natural regulation", there are no management goals or objectives. Instead, anything is acceptable as long as it is natural. Even if the entire park was consumed by fire, Yellowstone's managers would have no objection, as long as lightning ignited the blazes.

To test the validity of the USNPS's "natural regulation" paradigm, I: (1) measured aspen, willow, and other plant communities inside and outside Yellowstone Park, as well as inside and outside ungulate-proof exclosures; (2) completed 125 repeat photosets dating back to 1872 of aspen and willow communities; (3) measured 600 burned aspen stands to see if fire would rejuvenate those communities despite ungulate browsing; (4) searched over 50,000 historical photographs to determine whether or not woody vegetation exhibited signs of extensive browsing when Yellowstone Park was established; (5) analysed 20 first-person historical accounts written between 1835 and 1876 to determine how frequently elk and other animals were observed by early park explorers; (6) conducted beaver population surveys to determine if elk had competitively excluded this sympatric herbivore; and (7) synthesized existing archaeological data to determine if thousands of elk and other ungulates have always inhabited Yellowstone (see Kay 1990 for details).

I found that: (1) the area occupied by aspen and tall willow communities has declined by 95% since Yellowstone Park was established due to repeated browsing, not other factors (Kay 1985, 1990; Chadde and Kay 1988, 1991; Kay and Chadde 1992). (2) Aspen and willows depicted in 1870-1890 photographs resemble those found inside exclosures today which suggests that the level of ungulate browsing inside exclosures approximates the level of ungulate use existing when Yellowstone Park was established in 1872 (Kay 1990, Chadde and Kay 1991, Kay and Wagner in press). (3) Contrary to USNPS claims, burned aspen stands were not able to successfully regenerate because repeated browsing prevented plants from growing taller than 1 m (Kay 1990). (4) Aspen, willow, and conifers depicted in 1870-1890 photographs showed no evidence of ungulate browsing. Instead, early photographs indicate that few elk or other ungulates wintered in Yellowstone through the 1700's and 1800's (Kay 1990, Kay and Wagner in press). (5) Early historical records provide no evidence that thousands of resources-limited elk ever inhabited Yellowstone. Between 1835 and 1876, 20 different expeditions spent a total of 765 days in the Yellowstone Ecosystem on foot or horseback, yet they reported seeing elk only 42 times, or one elk sighting per every 18 days. Bison were seen on only three occasions, but not in Yellowstone Park, and no one reported seeing even a single wolf (Kay 1990, Kay in press). (6) Beaver were common on Yellowstone's northern range during the 1800's, but are virtually extinct today because repeated ungulate browsing has eliminated aspen and willows beaver need for food and dam building materials. Ungulate browsing has changed entire plant and animal communities (Kay 1990, Chadde and Kay 1991). (7) Elk bones have rarely been unearthed at archaeological sites in the Yellowstone Ecosystem (Kay 1987, 1992). Of over 52,000 ungulate bones identified at 200 Intermountain archaeological sites, only 3% were elk. Archaeological data do not support the notion that tens of thousands of elk always inhabited the Yellowstone Ecosystem or the Intermountain West (Kay 1990).

In sum, these data do not support the USNPS's "natural regulation", let-nature-take-its-course management. Instead of a supposed natural ecosystem, Yellowstone Park is a highly degraded area. This is also true of other U.S. National Parks where "natural regulation" schemes have been implemented (Hess in press).

Thus, the following lessons can be drawn from these experiences: (1) Present conditions in Yellowstone and other U.S. national parks do not represent the conditions that existed prior to European influence. They are not vignettes of primitive America. (2) To maintain an area's ecological integrity, it is first necessary to determine what key factors structured those ecosystems in pre-Columbian times. (3) Prior to the arrival of Europeans, ungulate communities throughout most of North America were not food limited. (4) Instead, predation by Native Americans and carnivores limited the numbers and distribution of ungulates except where the prey species had refugia in time or space (Kay in press, Kay in prep). (5) Wilderness is a myth. Before its "discovery" by Europeans, most of North America was owned, used, and modified by Native people (Gomez-Pompa and Kaus 1992, Simms 1992). (6) A balance of nature has never existed and that concept is an ecological myth (Botkin 1990, 1992). (7) A hands-off approach to management will not re-establish the conditions that existed in pre-Columbian times. Present conditions in Yellowstone are unique in that area's history, and do not represent an earlier time.

These lessons also apply to Canada's National Parks. Banff National Park, for instance, has an elk-aspen problem similar to Yellowstone's. The same is true in Jasper National Park and on the Canadian Park Service's Yaha Tinda ranch. I am now working with the warden staff in Banff to synthesize existing information on historical wildlife observations, archaeological evidence, aspen ecology, fire history, repeat photographs, and aboriginal land use. We are constructing a model of how the Banff ecosystem functioned then and now. Our model will focus on elk, aspen, fire, wolves, and humans as key ecosystem components. By adopting a far reaching historical perspective, our work will help define Banff's ecological integrity, and it will also help the Canadian Parks Service avoid the mistakes made in Yellowstone and other U.S. parks.

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