Aboriginal Overkill and Native Burning: Implications for Modern Ecosystem Management

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Environmental Myths

Western environmental philosophies, which often treat how our national parks and natural areas are managed, rest on four assumptions: First, that there is a “balance of nature,” where ecosystems achieve a constancy or equilibrium that persists through time. Implicit in this assumption is the belief that climax vegetation was widespread in pre-Columbian times. Second, conservations invariably assume that, prior to the arrival of Europeans, America was a “wilderness” untouched by the hand of man, and, third, that this “wilderness” teemed with wildlife, especially ungulates like elk (Cervus elaphus), moose (Alces alces), and pronghorn (Antilocapra americana). Fourth, and finally, is the assumption that Native Americans were either poor, primitive, savaging savages whose numbers were too low to have any impact on the “pristine” landscape (Johsen 1991:88) or that native peoples were children of nature and original conservationists who were wise in knowing their environments (Atwood 1991).

According to this view, pre-Columbian America was a “Garden of Eden” teeming with uncountable numbers of ungulates, wolves (Canis lupus), and other wildlife, and Europeans were the evil ones that destroyed this idyllic scene of nature (McNamee 1988: Rosko 1990, Vrba 1991). So under this paradigm, all that is needed to restore our ecosystems to their original condition is to eliminate European influences. This is known as “letting nature take its course” and is often referred to as “hands-off” or “natural regulation” management. These beliefs are so strongly held by many ecologists that they seldom bother to consider whether they are, in fact, valid. If they are not, then adhering to this philosophy will not lead to the protection of biological diversity or ecological integrity. That is to say, if these underlying assumptions about nature are false, then management based on these beliefs will not produce the desired result, i.e., the original ecosystems will neither be restored nor protected.

Although these “Garden of Eden” assumptions are romantically and bureaucratically appealing, unfortunately, they are also false gods. As Doak (1990), Pickens (1991), and others (e.g., Madsen and Madsen 1992, Pickets et al., 1992, DeGraaf and Firey 1993, Tansley et al., 1993) have strongly demonstrated, the balance-of-nature myth, I will not explore that subject further except to note that disturbance and change are the only ecosystem constants—there certainly was no forest permanent, in fact, old growth forests, as we know them today, were very rare in pre-Columbian times (Stout 1985, Zinke 1993, Covington and Moore 1994). Instead, I will discuss the remaining myth, namely that the Intermountain West once teemed with game, that America was a “wilderness” ca. 1492, and that Native Americans had little impact on pre-Columbian ecosystems.

Lack of Game

Historical records do not support the view that the Intermountain West teemed with wildlife. Jacob (1991:118) and Rockwell (1991:63), for instance, claimed that game were abundant throughout the northern Rocky Mountain, numbering in the tens of thousands; before these animals were slaughtered by unregulated hunting, but only for traps, wolves reported seeing a killing even a single moose. When Peter Skene Ogden’s (1850:73) for his horse before the range often noted, “The place of the man settlements has been a moose having spent a total of nearly 1800 years in the West during the early 1800s. Although not as rare as moose, elk were also historically uncommon in the Rocky Mountains. Between 1835 and 1872, for example, 30 different parties spent a total of 765 days traveling through Yellowstone on foot or horseback, yet reported seeing elk only once every 18 days—today there are nearly 100,000 elk in this ecosystem (Kay 1990a in press). The same was true in the Canadian Rockies where early explorers reported seeing elk only once every 31 days (Kay et al. 1984; Roy and White in press). During the 1800s, elk were also less or absent from Utah, Arizona, and New Mexico as well as other regions of the Intermountain West.
Table 1. The effect of urea stimulation on berry production in the Yellowstone ecosystem. The number of berries produced by plants growing in a urea solution at low soil pH was compared with the number of berries produced by the same species outside the exclusion. The Lamar Island and Geyser basin excludes are in Yellowstone Park while the Utl Hill and Camp Creek excludes are in Jackson Hole. This also explains why Yellowstone's grizzlies (Ursus arctos) do not consume large quantities of berries, unlike bears in other ecosystems. From 1977 to 1992, over 10,000 grizzly bear scat samples were collected and analyzed in Yellowstone, yet chokes were only reported in one case, which was in a tree, and all the berries were phenol accumulating camaduline in 51. Adapted from Kay (1993, in press b).
connection between their hunting and game numbers, their system of religious beliefs actually fostered the overexploitation of sagebrush populations. Religious respect for animals does not include conservation.

Indeed, all native hunters are essentially opportunistic and tend to take high-ranking ungulates regardless of the size of the prey populations or the likelihood of those animals becoming extinct. Native Americans had no concept of maximum sustained yield and did not manage ungulate populations to produce the greatest return. In addition, human predation and predation by carnivores are additive and work in concert to reduce ungulate numbers (Walters et al. 1984). Moreover, competition from carnivores tended to negate any possible conservation practices (Kay 1984a).

Because Native Americans could prey on small animals, vegetarian foods, and fish, they could take their preferred ungulate prey in lower densities or extinction without having any adverse effect on human populations. In fact, once Native Americans killed off all the ungulates, human populations actually rose (Hawkes 1991, 1992, 1993).

These were, however, exceptions to aboriginal overkill. According to predator-prey theory, prey populations will increase if they have a refuge where they are safe from predation (Taylor 1984). So, ungulates that could escape aboriginal hunters in time or in space should have been more abundant. Moreover, refuges do not have to be completely effective. Partial refuges will also decrease prey populations to survive. This explains why there were larger numbers of ungulates on the Great Plains and in the Arctic. By undertaking long-distance migrations, the polar bear (Ursus maritimus) and the musk ox (Ovibos moschatus) were able to avoid disturbance most of their human and carnivorous predators (Kay 1994a). Ungulates were not able to survive in buffalo ranges between 1878 and 1890 that were locked in mortal combat (Hickerson 1965). Lewis and Clark (1804, 1811), for instance, noted that, “With regard to game in general, we observed that the greatest quantities of wild animals are usually found in the country lying between nations at war.”

Native Burning

Besides keeping ungulate numbers low, Native Americans also had a major impact on ecosystems by repeatedly firing the vegetation. They did this to modify plant and animal communities for human benefit. In California, for instance, native peoples had at least 70 different reasons for igniting vegetation (Lewis 1973, Tinkham et al. 1982), and even in northern Canada, where the vegetation is less diverse, Native Americans still set fires for at least 17 different reasons (Lewis 1979, Reid 1987, Lewis and Ferguson 1988). While aboriginal burning has been widely reported in the archaeological literature (e.g., Lewis 1981, 1982, 1992b, 1992c, 1998b, Tinkham 1991, Anderson 1995, Pyne 1990, Goebel 1994), those data have largely been ignored by land managers, especially in our national parks and wildlife areas (Lewis 1992, Martinez 1993). In Yellowstone, for example, the Park Service contends that aboriginal fires were unimportant, and
that most fires were historically started by lightning (Loose and Gruell 1973:434, Ronayne and Depepin 1989). This position, though, is not supported by available geological evidence. Instead, most fires were started by Native Americans, especially in montane habitats.

Prior to park establishment, Yellowstone’s northern range had a fire-return interval of once every 25 yr (Houston 1973, 1982). Yellowstone has had a “let burn” policy for nearly 25 yr, yet during that period, lightning-caused fires have burned prairie primarily near the northern range. In 1989, fires burned approximately one-third of the area, with three-quarters of the fire area unburned, according to agency definitions, that was “unnatural” because the fire was started by man. Lighting, besides, the 1988 fires are thought to be a 100-300-year event (Schulteley 1980a, 1995b), so similar fires could not have caused the original 25-yr fire frequency.

Despite a series of droughts, why has Yellowstone’s northern range retained virtually unburned? Park biologists contend that this is because “lightning has chosen not to strike very often on the northern range” (Depepin et al. 1980:105).

That assertion, though, is not supported by data from the Bureau of Land Management’s Automatic Lightning Strike Detection System which shows that, on average, lightning strikes the northern range 4 times per km²/year (Kay 1990:136–137). So lightning strikes, but why doesn’t the range burn? The answer is that when most lightning strikes occur, the herbaceous vegetation is too green to carry a fire.

Remote photography and fire history studies indicate that waxy aspen (Populus trichocarpa) communities burned frequently in the past, yet experience has proven that aspen is extremely difficult to burn (Brown and Zimmermann 1986). Territorial aspen “asbestos tine” and “firebreak” are often used to describe aspen (DeByle 1987:775). Even raging crown fires in contiguous forests seldom burn adjacent aspen communities (Fletcher and Barnosky 1976). At current rates of burning, “it would require about 12,000 years to burn the entire aspen type in the West” (DeByle et al. 1987:733). Something is clearly different today than it was in the past.

Research has shown that aspen communities will readily burn but only when aspen is deciduous and when understory plants are dry conditions that occur only in early spring and late in the fall (Brown and Zimmermann 1986). Prior to May 15th and after September 15th, however, there are few lightning strikes and virtually no lightning fires in the West (Figure 2). So, if aspen stands burned at frequent intervals in the past as data indicate they did, including those on Yellowstone’s northern range, then the majority of these fires were most likely set by Native Americans.

Determining how fires started in certain ecological”, “forest set by water-gathering differs from lightning”, “in terms of seasonality, frequency, intensity, and ignition patterns” (Lewis 1985:75). Most aboriginal fires were set in the spring, between snowmelt and vegetation growth, or late in the fall when burning conditions were not severe. Unlike lightning fires, which tend to be infrequent high intensity infernos, native burning produced a higher frequency of lower intensity fires. So, aboriginal burning and lightning fires create different vegetation mosaics, and in many instances, entirely different plant communities (Anderson 1993, Blackburn and

Figure 2. Temporal distribution of lightning strikes and vegetation on Yellowstone’s northern range and in Wyoming’s Jackson Hole (Kay 1990:130). When aspen communities are normally dry enough to burn in early spring, prior to green-up, or late in autumn, after aspen leaf-fall, there are few lightning strikes and virtually no lightning fires. So, if aspen burned frequently in the past as data indicate they did, then the vast majority of those fires were most likely started by Native Americans.


Conclusions

Most national parks, wilderness areas, and nature reserves are supposedly managed to represent the conditions that existed in pre-Columbian times; i.e., so-called natural or pristine conditions. But what is natural? If Native Americans determined the structure of entire plant and animal communities by fostering the vegetation and by limiting ungulate numbers, then that is a completely different situation than what we have today (Montagg 1993, Wagner and Kay 1993). A hands-off or natural regulation approach by modern land managers will not duplicate the ecological conditions under which the environment was shaped (Wagner et al., in press).

Since aboriginal predation and burning existed there communities, the only way to maintain what we call natural areas today is to duplicate aboriginal influences and processes (Montagg 1993, Wagner et al., in press).

Prior to the early 1800s, for example, millions of beaver (Castor canadensis) occupied the drainageways throughout the West. Beaver were so abundant that in 1855, Pierce Shote Ogelton’s party was able to trap 511 beavers in only 5 days on Utah’s Green River, while in 1839, Ogelton reported that his party brought 3,000 beaver in a month on Nevada’s Truckee River (Kay 1994a). Yellowstone has since contained large numbers of beavers, but that species is now ecologically extinct on the park’s northern range (Chadde and Kay 1991). Without native hunters, the park’s burgeoning elk population has destroyed the willows (Salix sp.) and aspen communities beaver need for food and dam building materials (Chadde and Kay 1991, Kay and Chadde 1992). So, natural regulation management has not maintained Yellowstone’s ecological integrity. It has reestablished the ecosystem’s original conditions.

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Current Blue oak woodland in the Sierra Nevada foothills, C.A. Photo by Douglas D. McCreary.

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