Bison Conservation: Saving an Ecologically and Culturally Keystone Species

Clay Duval

This essay began as assignment for my conservation ethics Writing 20 class taught by Dr. Julie Reynolds. The initial assignment required me to write a case-study for the conservation of an endangered species. I had a pre-existing interest in bison from a fun-filled summer of adventure and research that I conducted at the Teton Science School in Kelly, Wyoming. There, we estimated the amount of bison a local ecosystem could sustain based on our own field research. It was amazing back then how what began as a dry hypothesis lead to an exciting journey. After two years of dormancy, that journey of learning continued last year at Duke. And while the experience has been admittedly more academic and less experiential, it has been unquestionably as rewarding as the first.

From the start, this project was more to me than a grade. It was my first collegiate opportunity to take my writing to a higher level. It reflected my ability to think critically and to synthesize information in a creative way that others haven't done. It was an opportunity to explore some of my own Native American heritage, and to learn something about American history and ecology. Most of all, it was just a lot of fun. Writing this essay has taught me what I already knew: there is no substitute for deep involvement in any activity or pursuit. I encourage you, regardless of your occupation or interests, to make a personal investment in your writing. Don't be afraid to leave your mark, on the page as well as off.

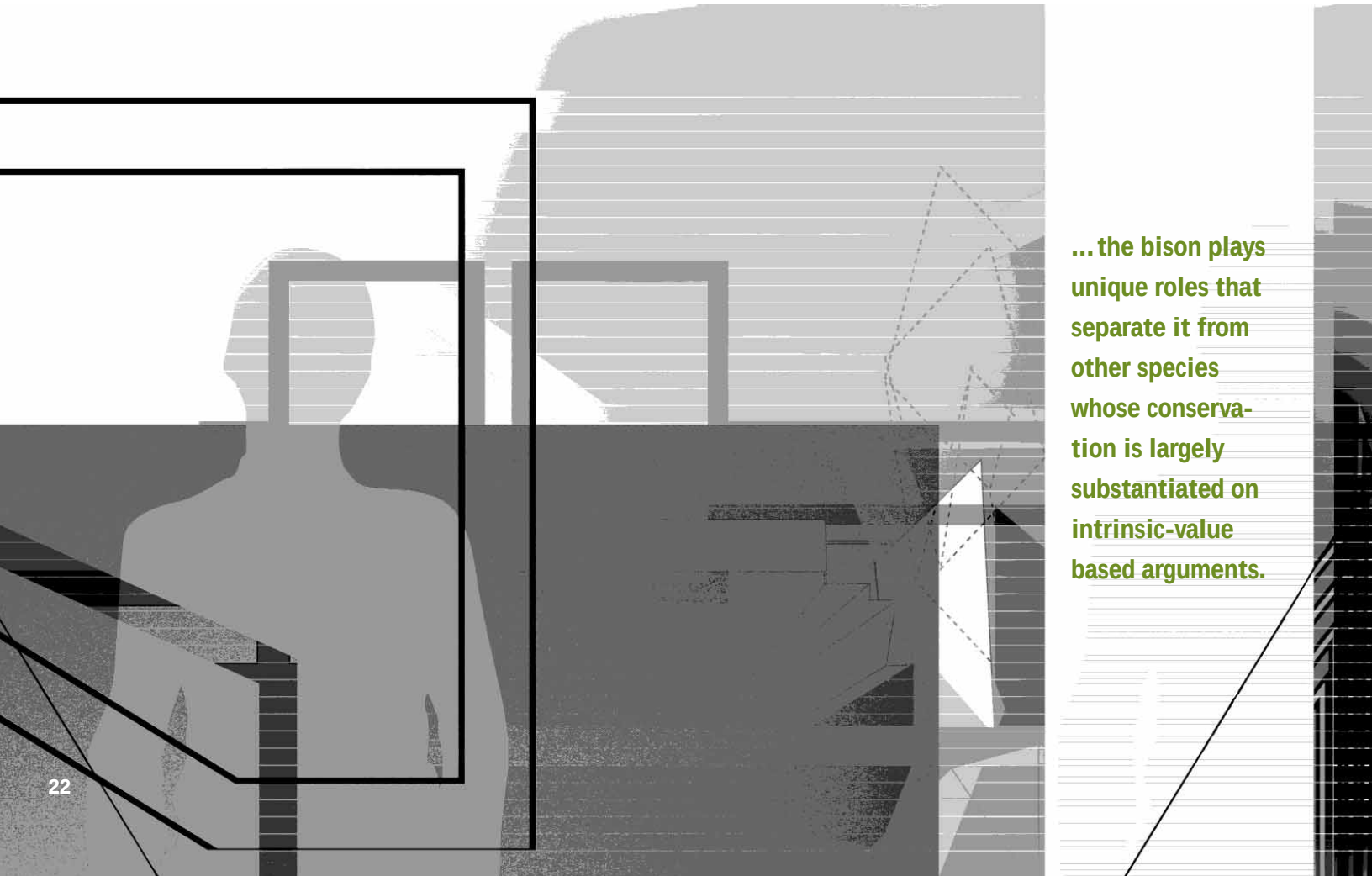
A sun sets upon an orange horizon as bison chew contently among the sloping lands of Yellowstone National Park. It is the same sun that shone over the shoulders of the mighty herds 30 million strong as they ranged throughout the plains. It is the same sun that witnessed the arrival of the white man in a vast sea of the red. And it is the same sun that, as it wanes in the evening sky, now witnesses the end of a great bison epic. Yet the story of the bison need not be over. The conservation of wild bison is a controversial topic, and many believe that it is a lost or unworthy cause. The truth is that there are few species whose continued existence will contribute so much as will bison. Their survival will aid in the survival of hundreds of other species, the prairie ecosystem, Native American culture and an invaluable piece of American history. It would also contribute to worldwide efforts to solve problems such as global warming and topsoil erosion, along with its subsequent agricultural losses. The breadth, magnitude and importance of the bison's contributions have earned it a status that exceeds that of most species because its ecological, cultural, spiritual and historical roles amplify its contributions to a scale that far exceeds the measure of its independent involvement. Perhaps more so than any other megafauna that has walked the earth, the bison's contribution to humanity deserves respect. And the most fundamental respect one can grant to the bison is to recognize that even in a wonderfully technological and developed world, humans still rely on the other living creatures among us to support the most fundamental sources of life. Thus, the purpose of this essay is to elucidate the links between the bison and the roles that it plays so that professionals with ecological, conservational, agricultural and cultural agendas can see that there is a point of tangency in which the aims of their various endeavors— the conservation of biodiversity, of bison, of global temperature equilibrium, of Native American culture— converge into one means: the conservation of *Bison bison*.

Perhaps more so than any other megafauna that has walked the earth, the bison's contribution to humanity deserves respect.

To fully appreciate the plight of the bison and the consequences of its conservation, one must know its history. Bison, the largest land mammal in North America, is estimated to have numbered around 30 million before the 1800s (McHugh, 1972). However the European colonization of America almost led to the extinction of bison by placing them at the mercy of political and economic practices and by subjecting them to the ecological consequences of the western expansion movement. The apparently endless herds of bison seemed to suggest that there was little value in frugality of hunting practices. More than simply wasteful, however, the widespread extermination of bison was used as a political means of suppressing Native

American resistance to colonization efforts and "civilizing" them (Cong. Record 1874). The value of the conservation of bison has been called into question again in recent years. Although the bison were certainly in dire straights at the dawning of the 20th century, with just one thousand of the approximately 30 million that once roamed the plains surviving (Burton, 2000), the adoption of bison as a form of livestock in private ranches has bolstered their numbers into the hundreds of thousands (Boyd, 2003). Some may argue that no substantial threat to the continued existence of bison is posed because of the large cache of bison preserved for their economic value on these ranches. Others may advocate that the conservation of bison be relegated to the domain of National Parks such as Yellowstone and Grand Teton National parks in Wyoming. Their mandates specifically include the conservation of such species. Yet others may find that in many instances, the conservation of bison should not take priority over the livelihood and needs of humans. All of these perspectives are valid and should be taken in consideration when evaluating the merit of the conservation of bison. However, the bison plays unique roles that separate it from other species whose conservation is largely substantiated on intrinsic-value based arguments. Among these is the bison's ability to increase biodiversity in the tallgrass prairie.

Biodiversity is short for biological diversity and represents the "totality of life forms, from planetary spectrum to subunits of species together with ecosystems and their ecological processes" (Myers, 1996). Estimates of the biodiversity of Earth have ranged from 8-100 million species, although the accuracy of these estimates could potentially be conservative by an entire order of magnitude. Conservation biologists have traditionally argued for the merit of biodiversity on its two primary contributions to society: material goods and environmental services. The material goods various organisms and microorganisms have given to society are well-documented; they include new and improved foods, new medicines, raw materials and bioenergy (Myers, 1996). One article estimates the economic benefits of biodiversity in the United States to be $319,000,000,000 (Pimentel, 1997). Even more importantly, biodiversity provides innumerable environmental services that are essential to the survival of human life. Biodiversity plays an enormous role in maintaining the gaseous composition of the atmosphere and in the processing of minerals, energy and water. From the pollination of major crops to the preservation of topsoil to the sustenance of hydrological cycles, biodiversity is important for the healthy functioning of an ecosystem. Perhaps the most important impetus to increase biodiversity is its ability to increase ecosystem resilience, or the ability of



...the bison plays unique roles that separate it from other species whose conservation is largely substantiated on intrinsic-value based arguments.

an ecosystem to resist stresses and shock, absorb disturbance and recover from disruptive change.

Thus, efforts to increase biodiversity in the prairie are timely indeed. The prairie has experienced enormous amounts of change since the reign of the bison. Agricultural and residential development of the prairie may have reduced it to only 0.1% of its former area (Samson and Knopf, 1994). Topsoil erosion, the inhibition of wildfires, and the use of underground water reserves for irrigation have changed the dynamics of the prairie ecosystem. If the prairie is to survive these trials, its ecosystem resilience—and thus its biodiversity—must be as high as possible. The gravity of the situation is perhaps best expressed by Norman Myers (1996), a renowned environmental scholar and author: "What we do, or don't do, in just the next few decades will determine how many, or how few, species we share the planet with over the next several million years, [that is] until the current biotic crisis has worked its destructive way throughout the biosphere."

Conservation of bison may be the most promising method of preserving a wider host of biodiversity in the tallgrass prairie. New research suggests that bison is indeed a keystone species for conservation (Boyd, 2003), with a particular importance for the prairies. Bison have been proven to increase biodiversity by: varying the kinds of spacing and timing of vegetative growth on the prairie, promoting the restoration of underground carbohydrate reserves, altering soil composition, inhibiting growth of woody plants, catalyzing nitrogen cycling and influencing prairie fires. Bison bring about these remarkable effects through a variety of mechanisms, some of which serve multiple ecological roles. These mechanisms can be divided into two general categories: behavioral and physiological.

One of the most notable behavioral contributions of bison is found in their food selection; research has shown that bison are picky eaters indeed! Bison show selective grazing preferences both in the locations in which they graze and the plants that they consume while grazing (Peden *et. al*, 1974). Because some areas are naturally more compatible with these observed preferences than others, bison often use some areas more than others and thus create a mosaic of both grazed and ungrazed lands within an ecosystem. Such a mosaic produces a heterogeneity that provides an atmosphere abundant with opportunities for different species to coexist within the same ecosystem. Furthermore, since the bison's favorite food is the also the prairie's most dominant plant group, the bison allow for competitively disadvantaged plant species, such as forbs, to continue to flourish.

Forbs are non-woody herbaceous plants that differ from grasses in that they are often broad-leafed and have showy flowers. Years of evolution have provided many prairie grasses with a more specialized method of photosynthesis, "C4", which makes them less vulnerable to the intense heat of the open prairie. Forbs, which utilize the unspecialized "C3" method of photosynthesis, can't compete alone with the more efficient C4 method. While it looks like the fight is over with the grasses on top, the forbs, which represent a large portion of the prairie's biodiversity, have historically relied on a powerful ally: the bison.

Bison prefer dominant grasses instead of forbs and other vegetation typical of the prairie, which usually consist of less than 10% of their diet; in fact, bison will avoid forbs even when they are in great abundance, if there remains a grass alternative (Fahnestock and Knapp, 1993). This selective grazing adds another variable in the factors that influence competitive interactions among vegetative prairie species. Because the bison feed on grasses predominately, the forbs are relieved from competition from the C4 grasses, and are allowed to flourish. In effect, bison convert "species-poor, grass-dominated sites [into] sites of locally higher [bio]-diversity" (Knapp *et al.*, 1999).

Grazing behaviors of bison not only increase biodiversity, but play a role in regulating an important resource upon which most plants depend for growth: nitrogen. Bison regulate the amounts of nitrogen in two ways. First, they minimize the loss of nitrogen-containing ammonia through combustion. Fire is the principal source of nitrogen loss in the prairie (Blair, 1997). The bison inherently limit the amount of nitrogen potentially able to be lost by consuming the aboveground reserves of nitrogen that exist in the forms of leaf area and grass detritus. While in their bodies, the nitrogen is protected from fires—bison can run from fires, leaves can't—and quickly upon leaving their bodies the nitrogen is redeposited into the soil in the form of urine. Secondly, they induce biological changes in grasses that increase nitrogen mineralization in the soil. Bison grazing increases both the rates of nitrogen absorption (Knapp *et. al*, 1999) and the concentrations of nitrogen available in the grasses (Holland and Detling, 1990). Because the plants have increased levels of nitrogen, their carbon:nitrogen ratio decreases. A lower C:N ratio reduces the amount of microbial immobilization (Knapp *et. al*, 1999), a process through which bacteria convert plant-ready nitrogen in the soil into a form which plants are unable to use. Therefore by reducing the C:N and thereby reducing microbial immobilization, bison effectively increase the amount of nitrogen that is in a form usable by plants.

One of the reasons why the bison is such a pervasive symbol of power and strength is its habit of horning, rubbing, and trampling things on a daily basis, activities that can actually cause landscape level changes in environmental composition. More than

just a relic expression of their plains dominance, these activities can increase biodiversity and maintain the integrity of the prairie. Horning, rubbing and trampling by bison is one factor that could have lead to the lack of trees that is characteristic of the prairie ecosystem (Coppedge and Shaw, 1997). Certainly in the early 1800s and before, when the American bison populations was estimated to be at least 30 million, the roaming herds would have caused extensive damage to any woody vegetation in their path. As if they weren't rambunctious enough, bison also create huge saucer-like depressions called wallows. Wallowing starts off with a bison pawing the ground and then rolling in the exposed soil. Wallows are continually used and can grow to as large as 16 feet in diameter and a foot in depth (Knapp *et. al*, 1999). These wallows can drastically alter the patch structure of the prairie, especially considering the number of them that were present when bison were so plentiful; bison wallows were certainly an abundant feature of the landscape in lands that were prairies prior to development. In fact, the University of Oklahoma had to fill in a number of old wallows that existed in the site of the football field before their first home game in 1895 (Knapp *et. al*, 1999). Bison wallows compact the soil and reduce water infiltration (the movement of water from the land surface to the soil) significantly enough to allow them to retain water. In effect, these wallows can transform into small pools that allow for some wetland species to make their home in the prairie (Knapp *et. al*, 1999). Obviously, the existence of such species is predicated upon the presence of wallows, and thus wallows contribute to biodiversity in the prairie. And because wallows are a physical characteristic of the land, they further environmental heterogeneity as well.

One of the reasons why the bison is such a pervasive symbol of power and strength is its habit of horning, rubbing, and trampling things on a daily basis, activities that can actually cause landscape level changes in environmental composition.

Considering how boisterous they can be on the open plain, it is a curious fact that wild bison herding instincts minimize damage to prairie stream communities upon the event of a fording. Although some negative impacts are inevitable, such as the widening of the stream channel at the crossing, fluvial erosion, and higher percentages of silt substrate, recent research suggests that bison have less impact on aquatic communities than do livestock such as cattle and sheep (Fritz *et. al*, 1999). Also, bison are able to self-regulate their temperature better in warmer weather than their other ungulate cousins due to their lower metabolic rates. This allows them to spend less time in and around stream communities for cooling purposes than cows and sheep, which minimizes the opportunity for bison to have a negative impact on prairie stream communities (another important source of prairie biodiversity).

While the habits instinctive to wild bison do indeed constitute a large part of what make bison so ecologically essential, there is a good deal to do with the pure physiology of the bison that allows it to contribute to prairie communities. For example, the physiological structure of the mandibles of bison makes them unable to chew grasses down shorter than two inches from the ground. This has enormous importance for the maintenance of biologically productive prairies for two reasons. First, it allows bison to lower the leaf area of the grasses significantly enough to induce compensatory increases in photosynthesis, which increases the biological productivity of the plant. Second, it prevents the bison from cropping the grass so short to the ground that it precludes their ability to recover.

Bison's digestive systems process their food in such a way as to produce fecal matter with unique and consequential properties. In their article written in the *American Midland Naturalist*, Scott Crockett and David Engle (1999) discuss the role that bison fecal patties play in increasing species richness and spatial homogeny in prairie communities. Their studies have shown that bison fecal matter has remarkably combustible properties. In fact, bison fecal matter releases 29 to 227 percent more heat per unit area than do high concentrations of woody fuels under drought conditions. Remarkably, the potent combustibility of the fecal matter may have played an ominous role in the shaping of the great plains. The intense heats associated with the bison patties produce changes in soil composition and physical structure. It can cause water to seep into the soil more slowly, change the concentration of ammonium and nitrate supplies, and reduce the amount of mineralization in the soil. These changes further the mosaic dynamic of the prairie and thus help to contribute to biodiversity. Fires that are not fueled by bison patties play an important role in maintaining a spatially heterogeneous landscape. However, the addition of random piles of bison fecal matter exaggerates the mosaic patchiness of prairie structure.

In addition to the expulsion of excremental solids, bison urine plays an enormous role in maintaining the high rate of biological productivity which is characteristic of the prairie ecosystem. One of the limiting factors in the biological productivity of an ecosystem is the rate of nitrogen return into forms usable by plant life. The conventional method for

nitrogen to be recycled involves the help of fungi that live underground in the roots of plants. However, for the nitrogen to get down there, it must be decomposed from plant litter residing on the surface. This process can take quite some time. Bison expedite the process by eating the aboveground biomass, digesting it, and freeing the nitrogen within into a more labile form: urine. Bison urine can be converted in a matter of days into the plant-usable source of nitrogen, ammonium (Ruess and McNaughton, 1988). Additionally, since urine is liquid it can easily be absorbed into the soil, assuming adequate levels of soil infiltration, where it can be used by the plant's roots.

If the solid and liquid excretions of bison can produce such immense effects, then imagine the effect that the nutrients of an entire bison will have upon being absorbed into the soil. This, in fact, is indeed a large and important source of nutrition for the prairie ecosystem. Given the enormous populations of bison up until the 1800s, the rate of bison mortality would have been sufficiently large to make bison carcasses relatively common. The death of a bison initially releases so many bodily fluids as to make the surrounding area toxic as the bison decomposes and can kill up to 6 square meters of vegetation surrounding it. However, over time the carcass site becomes a zone of high fertility which boasts growth rates two to three times higher than those in the surrounding undisturbed prairie (Knapp *et. al*, 1999).

To value conservation of the prairie is, then, to value the conservation of the bison because the two are inextricably linked. If one loses all of the wild bison roaming on the prairie, one will lose the prairie as well. Yet the question begs to be asked: In today's busy modern society, what merits the conservation of the prairie? Does the prairie present any value to contemporary Americans and the global community?

The answer is a resounding "Yes." The prairie is the largest vegetative province in North America and is composed primarily of grasses (Samson and Knopf, 1994). Grasses are enormously important to human welfare as they indirectly provide the majority of human nourishment (Samson and Knopf, 1994). The loss of the prairie would bring about the loss of countless grass species. In terms of biodiversity, the prairie is home to an abundance of species of which 55 are endangered or threatened and of which 728 are candidates (Samson and Knopf, 1994). Perhaps most importantly, the prairie grasslands may be one of the most promising answers to the problem of global warming.

Prevailing scientific opinion on the phenomenon of global warming suggests that it is largely anthropogenic in nature and the main human-associated causes of global warming are the increased amounts of greenhouse gases such as the carbon-containing CO_2. Luckily, plants use CO_2 during photosynthesis and therefore are able to help mitigate the effects of global warming by reducing one of the major greenhouse gases. Different biomes absorb the carbon dioxide in different ways and in different quantities. Ultimately though, the carbon from the atmosphere ends up in the vegetation or the soil which then become "carbon sinks." Prairie grasslands have been shown to be "superior carbon sinks when compared to forests with similar climatic characteristics" (Seastedt and Knapp, 1993). Can the amount of carbon contained in grasses really meet or exceed that contained in a forest of trees? A superficial evaluation would lead one to believe not; the truth, however, lies just beneath the surface—literally. While the aboveground carbon production in the forest obviously exceeds that of the grass-filled prairie, the prairie is much richer in its concentrations of underground carbon.

Finally, history can show us the consequences of the loss of the prairie. Agricultural development of the prairie without sustainable farming practices led to the "cultivation of marginal lands and the chronic overproduction of foodstuffs" (Samson and Knopf, 1994). Without the native grasses, topsoil erosion was enormous and led to the dust bowl and black blizzards of the 1930s that caused inconceivable losses to Midwest farmers and the American people. Unfortunately, we repeat many of those mistakes to this day. The continued conversion of prairie to farmland has led to agricultural erosion that has removed much of the prairie topsoil, undermining the region's ability to fruitfully produce for future generations (Samson and Knopf, 1994).

The two principal wardens of the prairie are the bison and the fire. Fires cause similar spatial heterogeneity, changes in soil composition, and inhibition of woody vegetation as do the bison. Because widespread prairie fires are suppressed due to their threat to humans residing in the vicinity, bison are the only remaining resource that can have a wide-scale, comprehensive and self-sustaining effect on the prairie

To value conservation of the prairie is, then, to value the conservation of the bison because the two are inextricably linked. If one loses all of the wild bison roaming on the prairie, one will lose the prairie as well.

ecosystem. Furthermore, the relegation of the prairie ecosystem to the private ranches where most of today's bison permanently reside will prove to be a vain gesture as size constraints and the increasingly technological nature of modern agriculture preclude the development of a true prairie. Conservation of bison is at the epicenter of prairie preservation.

Conservation of bison is also at the core of the cultural preservation of the Native Americans and the historical preservation of the American west. The fate of the bison will directly impact the fate of dozens of Native American tribes to whom the bison is of the utmost importance. The bison is so important to these cultures because there is a long history of interaction between the bison and the Plains Indians that has made an impact on almost every aspect of their cultural development. Bison is the glue that holds together Plains Indian culture; without it, Plains Indian culture will take the final step towards its own extinction. To fully appreciate the validity of this point and the depth of the Plains Indian's love of the bison, one must have knowledge of how they historically interacted with it in their daily lives and the roles it played in their culture.

One of the first European explorers who had the opportunity to observe the interactions between bison and man that existed in the plains of yesteryear was Francisco Vásquez de Coronado. He described the relationship of bison simply, but effectively: "The bison dominated all phases of the Plains Indian life."[1] The first and foremost use of the bison, but by no means the least significant, was as a food source. Contrary to their eastern and western neighbors, the Plains Indians were able to adopt a nomadic hunting lifestyle that relied on bison as the primary (and many times, the only) food source. Bison meat is higher in protein content, lower in fat content, richer, less fibrous and less game-like than the meats of other ungulates. It provided the Native Americans with a wholesome diet that led them to be one of the healthiest of peoples of their time. Disease was a rare occurrence until their exposure to smallpox and other European pathogens that decimated their people in the 19th century. Every edible part of the bison was eaten including the meat, organs, brains, the unborn fetus, and its placental membrane. Other parts were used to fulfill the non-nutritional needs of the tribal members. Bones were used to make implements and weapons, skulls were the source of important tribal medicine, and the hides were used to make blankets, garments, ropes, and housing. Additionally, the sinew could be used for cording and bowstrings and the hoofs could even be melted into glue.

While the material sustenance that the bison provided the Plains Indians was undoubtedly of enormous significance, the relation between bison and man was more than just that. Every aspect of the Plains Indians culture was formed to make it suitable to the attributes of the bison. Bison are what made the Plains Indians a nomadic culture. Bison are what lead them to be proficient leatherworkers. And Bison are what allowed the Plains Indians culture to be one that engaged in almost perpetual intertribal warfare without having to fear the dwindling of their populations as a result of the deaths inherent to war. In short, bison was the mold from which the cultures of the Arapaho, Assiniboine, Blackfoot, Cheyenne, Comanche, Crow, Gros Ventre, Kiowa, Kiowa-Apache, Sarsi and Teton Sioux were cast.

Because the bison assumed this crucial role in Indian American society, it only follows that it would play largely into their symbolic, ceremonial and spiritual life; such is indeed the case. For all practical purposes, the bison was worshipped by the Indians. They poetically described its movements, made sacred charms or sacrifices out of its body parts, and incorporated it into dances, superstitions, taboos, exclusive societies, spiritual visions, and cures. The Arikara tribe divides their universe into four representative parts: sunrise, thunder, wind and night. Each of these quarters also stood for a spiritual being. The bison was the guardian spirit of the southwest quarter, affirming that the bison were divinely placed on earth to support its people. The Teton Sioux tribe viewed the bison as its own deity, whose qualities of charity, fecundity, industry, and hospitality were the ones the valued most in their women. Therefore whenever a young girl within the tribe would enter puberty, this transitional period was honored with an intricate ceremony that would call upon the Buffalo God. The Kiowa tribe, on the other hand, has a religion that does not involve any singular "Great Spirit," but rather consists of the worship and deification of all of the various powers of nature. The most prominent of these deities was the Sun. The bison, however, came in a close second as they believed that it was the favored animal representative of the Sun God due to its strength and splendor. During the most sacred of their rituals, the Sun Dance, which involves a great deal of fasting and thirsting, the Kiowa always

had a stock of blessed bison tongues on the side to eat in case of emergencies. Also prominent among many of the Plains tribes was the use of the bison skull, which was used in everything from blessing burial sites to excruciating torture rites and confessions of sexual infidelity. In fact, bison were considered so sacred that even their chips (fecal patties) were considered of great spiritual value and were used to store sanctified objects such as medicine pipes. Special societies of men who had been visited by bison in supernatural visions existed and were given rights to wear buffalo headdresses during special performances. Even more revered than the typical headdress was the Sacred Hat of the Cheyenne, which was intricately decorated and its use only invoked in special circumstances such as the renewing of sacred arrows and the curing of grave illnesses. Additionally, in the event of a serious illness there existed among many tribes a society of "buffalo doctors" who placed absolute faith in medicinal abilities they claim to have learned from bison in mystical visions. It is likely that there have been few times in history where one species has had so comprehensive an influence on the lives of a people as the bison has had on the ways of the Plains Indians.

However, many may believe that the plight of the Indians is too dire and that it is too late to reconstruct a culture that cannot fit into modern society in the same form as it existed in historical times. This perspective is logical; however, one must remember that cultures are not static entities, do not exist in vacuums and can adapt to changing realities as long as their principal elements remain intact. For the Plains Indian culture, bison is such a principal element. The bison has enormous spiritual and symbolic significance to the Native American people that transcends any changes in the temporal status of their people. Because the Plains Indian invest so much of their hope and pride in the bison, any transgressions done against it and any adversities it faces pose more of a threat to their cultural survival than do the most of the trials they must face as a people. Therefore, the conservation of bison is perhaps the best step Americans could take towards aiding the Plains Indians in their quest for the survival of their cultural identity. Native American support would inevitably aid in efforts towards prairie conservation as well. As the historic stewards of the Plains, there are no other people more suited to become modern caretakers of the Plains than the Native American people. By conserving bison, we can at once preserve a species, a culture and a land.

Further, the bison's symbolic and cultural value is not limited to the cultures of Indians but is an integral part of the American spirit. The bison is a symbol to many of the American people of freedom, strength, and the American west. The bison is the mascot of countless high schools and universities. It is the official seal of the Department of the Interior. It has been commemorated by the U.S. government with coins, special edition currency (the "buffalo bill", a special-edition 10 dollar bill), and with hundreds of millions of printed postal stamps. Thousands of geographic locations including the names of towns, rivers and lakes have been named after or have names related to the American buffalo. The buffalo symbolizes so many things to so many people in America. For some it is a symbol of the West and a time when the nation was young and civilization was outdone by the vastness and beauty of the American wilderness. It was a time of great adventures and perilous journeys. Perhaps the role of bison as an American icon of strength and freedom is best described by James Earle Fraser, who designed the buffalo nickel coined by the U.S. treasury. When asked why he chose the buffalo for the coin, he replied: "My first objective was to produce a coin which was truly American, and that could not be confused with the currency of any other country. I made sure, therefore, to use none of the attributes that other nations had used in the past. And, in my search for symbols, I found no motif within the boundaries of the United States so distinctive as the American Buffalo" (Dary, 1989).[2]

Between 95 and 99.9% of the prairie is gone, and development and agricultural use makes the prospect of reverting the plains back to yesteryear improbable, if not impossible (Knapp *et. al*, 1999). Studies show that once the prairie is gone restoration can take several centuries (Schramm, 1990). I agree with the opinion of Lloyd Burton (2000) of the University of Colorado who believes that the first thing that needs to be done is to halt the legal reconstruction of bison into a form of livestock. Many court rulings have led the bison closer and closer to being regulated as a cow, sheep or any other form of livestock. To do so is to desacralize it and to undermine its chances at surviving as a wild species. This legal reconstruction often occurs when judges are unaware of the cultural and spiritual role of bison or blatantly decline to recognize such as significant. There have been instances in which judges have declared "aesthetic sensibilities" such as the cultural and spiritual interest in bison as legally non-

existent, and then reverted the decision, recognizing that these interests exist, but declaring that they are unaffected by destruction of bison who wander outside of Yellowstone National Park (Burton, 2000). Burton goes on in his article to discuss how such acts of cultural disregard are "important and ultimately discriminatory." To counteract this tendency, those whose have a shared interest in the preservation of the bison, such as conservationists and Indian tribes, need to focus on reinvigorating the bison as a conservational icon and to make the public more aware that its existence in the wild is still threatened. Secondly, prairie-supporting environmentalists and bison-supporting conservationists need to join forces, integrate their efforts, and make their causes synonymous.

The conservation of the bison, and thereby the prairie, will not be easy, nor will it occur overnight. It will take ongoing cooperative effort between many groups with varying motives and interests; yet the rewards outweigh the costs. By preserving the bison, we preserve and honor our American heritage, the culture of the Native American people and the lands that bore them for centuries. ■

Notes

[1] The following passage about the various cultural aspects of the Plains Indians was based on readings from *The Time of the Buffalo* by Tom McHugh; it is highly recommended for further reading.

[2] This passage about the various modes of symbolism of the bison was based on readings from *The Buffalo Book* by David Dary; it too is highly recommended for further reading.

Works Cited

Blair, J. M. 1997. Fire, N availability and plant response in grasslands: A test of the transient maxima hypothesis. *Ecology* 78: 2359-2368.

Boyd, D. P. 2003. Conservation of North American Bison: Status and Recommendations. University of Calgary Master's Degree Project.

Burton, L. 2000. Wild Sacred Icon or Wooly Cow?" Culture and the Legal Reconstruction of the American Bison. PoLAR 23: pp. 21-26.

Congressional Record 1874 2: 2106-2109.

Coppedge B. R., Shaw J. H. 1997. Effects of horn ing and rubbing by bison (*Bison bison*) on woody vegetation in a tallgrass prairie landscape. *American Midland Naturalist* 138: 189-196.

Crockett, J. S., Engle, D. M. 1999. Combustion Characteristics of Bison (*Bison bison*) Fecal Pats Ignited by Grassland Fires. *American Midland Naturalist* 141: 1: 12-18.

Dary, D. A. 1989. *The Buffalo Book: The Full Saga of the American Animal,* Rev. ed. Swallow Press/Ohio Univ. Press, Athens, pp. 384.

Fahnestock, J. T., Knapp A. K. 1993. Water relations and growth of tallgrass prairie forbs in response to selective herbivory by bison. *International Journal of Plant Science* 152: 432-440.

Fritz K. M., Dodds, W. K., Pontius J. 1999. The Effects of Bison Crossings on the Macroinvertebrate Community in a Tallgrass Prairie Stream. *American midland Naturalist* 141: 2: 253-265.

Holland E. A., Detling J. K. 1990. Plant responses to herbivory and belowground nitrogen cycling. *Ecology* 71: 1040-1049.

Knapp, A. K., Blair, J. M., Briggs, J. M., Collins, S. L., Hartnett, D. C., Johnson, L. C., Towne, E. G. 1999. The Keystone Role of Bison in North American Tallgrass Prairie. *BioScience* 49: 1: 39-50.

McHugh, T. 1972. *The Time of the Buffalo*, 1st ed. Knopf, NY, pp. 339.

Myers, N. 1996. Environmental Services of Biodiversity. *Proceedings of the National Academy of Sciences of the United States of America.* 1:2764-2769

Peden, D. G., Van Dyne, G. M., Rice, R. W., Hansen, R. M. 1974. The trophic ecology of L. on shortgrass plains. *Journal of Applied Ecology*. 11: 489-498.

Pimentel, D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Tran, Q., Saltman, T., Cliff, B. 1997. Economics and Environmental Benefits of Biodiversity. *BioScience*. 47:11: 747-757.

Ruess, R. W., McNaughton, S. J. 1988. Ammonia volatilization and the effects of large grazing mammals on nutrient loss from East African grasslands. *Oecologia* 77: 382-386.

Samson, F., Knopf, F. 1994. Prairie Conservation in North America. *BioScience*. 44:6:418-421.

Schramm, P. 1990. Prairie restoration: a 25-year perspective on establishment and management. *Proceedings of the Twelfth North American Prairie Conference: 169-177.*

Seastedt, T. R., Knapp, A. K. 1993. Consequences of Nonequilibrium Resource Availability Across Multiple Time Scales: The Transient Maxima Hypothesis. *The American Naturalist* 141:4:621-633.