

## Chapter One

# The Bison Heartland

For more than ten centuries the bison, elk, deer, and pronghorn played in grasslands that covered what we now label as a dozen states, over which they ranged freely as forage and browse and water sources drew them. They were kept from overrunning their food resources by two major kinds of predator, human hunters and disease organisms, though wolves and bears had some effect too. The sun-powered productivity of the continent's sea of grass was shared with millions of prairie dogs, with ferrets and badgers and hawks that preyed on the prairie dogs, and with billions of tiny decomposers that consumed dead organic material and sent it on its next life cycle. Deep, rich soils in the prairies and thin soils in the Plains were held in place against fierce winds and scouring rainstorms by a deep, tough network of perennial roots; thus, erosion was minimized and streams ran clear. The bounty of the landscape seemed immeasurable and eternal, with bison as its dominant feature.

Bison are quintessentially American animals: stalwart, noble symbols of wildness, freedom, and self-sufficiency. In their heyday, when 30 to 60 million bison roamed North America, they were the most numerous grazing animals on earth, far surpassing even the great African wildebeest herds.

The largest and most powerful animals on the continent, bison have a special claim on our attention. They are intimately tied to the history of America, as well as to the ecology of our grasslands. And, as we shall see, they have a place in our future as well.

The breathtaking splendor of the bison herds of three hundred years

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ago was almost indescribable to the first European observers. Today, when our cattle stand meekly behind fences and bawl for their dinner, those thundering wild herds are beyond our imagining. Then, bison were a standard part of the American landscape across half the continent, as omnipresent as cars are today. The random bounty they represented was incalculable, like that of falling fruit from tropical trees—they were simply *there*, part of the endless plenty offered by the original garden of the continent.

In several prehistoric forms, bison had endured in North America for hundreds of thousands of years. Indeed, it may well have been in pursuing bison that hunters first crossed the Bering land bridge and populated the Western Hemisphere. During the long centuries of Native American occupation of the continent, bison provided the Plains dwellers with food, shelter, clothing, fuel, and artifacts. Later, during settlement of the Midwest and Plains, bison furnished the Euro-American immigrants with food, warm robes and coats, and clean-burning dung chips for their cooking fires—an essential in largely treeless regions. Although later whites showed little compunction about wiping out the bison, America could not have become what it is if bison had not provided a living bridge across the Plains.

The first Spaniards who spotted bison understandably called them *vacas*, cows. But bison only superficially resemble cattle. For one thing, bison are surprisingly agile and fast: they can spin instantly on front or rear legs and can outrun the fastest horse over a five-mile chase. Bison are magnificent, muscular beasts: bulls weigh as much as a ton; cows, more than half that. Their stampedes literally make the earth tremble. They are eye-catching in their unique humped profile and shaggy coats; resourceful in finding grass, whether in dry seasons or in the teeth of blizzards; cooperative and resolute against predators.

As early observers learned, bison are wary of humans. People sometimes tame newborn bison calves, but not for long. Today's wild bison, such as those on the National Bison Range in Montana, can be herded by expert riders into enclosures for annual culling and vaccination, though a few recalcitrant bulls always elude the herders. Once driven into the corrals and chutes, many bison get hurt trying to kick or butt their way out even through 4-inch-thick timbers. The implicit motto of the bison rings

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with a determination we remember well from our history: Live Free or Die!

Their dominance of the American landscape rested on the fact that bison were perfectly adapted to life on the enormous grasslands of the continent. Bison are ruminants, with multipart stomachs that maintain a resident population of microbes to ferment chewed grass and render its nutrients absorbable. A typical bison day, whether over the long centuries or now, begins with a predawn grazing period, followed by alternating periods of regurgitating and chewing their cud and more grazing. This process enables bison to digest cellulose, the principal solid component of plants, and explains why they could be so numerous over such an extensive range.

A basic bison group numbers twenty to fifty animals; the endless herds described in frontier tales gathered only during migration. It was once believed that bison migrated seasonally over long distances from north to south and back, but it is now thought that their migrations covered only a few hundred miles and were generally directed toward better grazing land or water. Bison also move around because of weather, as has been observed in Yellowstone National Park and historically; fierce bliz-



Grazing bison move steadily over the grasslands, traveling almost as fast as a person walks. Photo: South Dakota Department of Tourism.

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zards drive them toward rougher or timbered country, where they can shelter from the wind and snow. A bison group will sometimes cross long stretches of dry country. Bison tend to visit water at least once a day, though they can, if necessary, go several days without water—far longer than cattle can. Movement over the land is led by mature females, who are



*A drawing of a bison by a Jesuit missionary explorer, Father Hennepin, about 1680. Many early attempts to catch the proper head position, hump outline, and sloping back were less successful.*

widely thought to be more intelligent than males and have an excellent memory for seasonal and spatial patterns of grass availability and locations of water sources. Nobody now alive has seen a really large migrating bison herd, but historical accounts describe, with perhaps some exaggeration, herds stretching as far as the eye can see, estimated to be as much as a hundred miles in length.

For bison, grazing involves movement while eating, over distances ranging from a quarter mile to three miles, followed by a brief resting period—not the relatively stationary grazing of cattle. Grazing bison may appear from a distance to be moving slowly, but they often travel at a good walking pace for a human. Due to their different anatomical structure, the gait of bison is not exactly like that of cattle.

In the wild, bison live for an average of twelve to fifteen years, though some individuals may live to forty. They are fearsome in defending themselves against predators. Predators, of course, are essential to every healthy ecosystem as regulators of population balances. Since the 1930s, scientists have known that predator control harms rather than helps bison and other large wild species, for steady predation is necessary to weed out weaker animals and thus keep the herd as a whole strong. In Canada, wolves have been observed hunting bison successfully—though they prefer to go after the relatively solitary moose—but careful observation in Yellowstone has revealed that severe winter weather kills far more bison than do predators of any kind. Native American hunters also played a crucial role as predators on bison before the European period. Their hunting impacts did not become ecologically unbalancing until whites brought them firearms and provided markets for hides and tongues.

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The condition of a bison's fur varies from the deep, thick, warm coat of late fall and winter through the ragged-looking coat of spring and summer when the heavy fur is being shed in patches. Because bison eyes are set farther out on the sides of the head than those of cattle, they have practically 360-degree vision. They can detect very distant movements that are almost imperceptible to humans. However, at closer ranges they rely more on their excellent senses of smell and hearing. Like other social animals, they remain acutely aware of the locations and dispositions of nearby herd-mates, on whom their welfare and sometimes their safety depend—but who in return demand unceasing attention to dominance-submission relationships.

Whether on the move or loafing around, a bison herd is surprisingly noisy. Groups of cows and their calves, either newly born or yearlings, tend to stick fairly close together and engage in steady interchanges through reassuring grunts—not the mooing many people expect. Attention is secured and deference demanded through a variety of sounds ranging from snorts to growls, often accompanied by attitude-adjustment butting. Occasionally bison will utter a sonorous snort that bears some resemblance to sounds made by their distant mammalian relatives, humpback whales. Bulls have a wide repertoire of threatening noises, from an early-warning low rumble with extended, whitish tongue to terrifying bellows and roars, which become so loud in the mating season that they can be heard as much as three miles away.

Like other animals, including humans, bison also signal their intentions by body postures. They maintain firm and stable dominance orders, among females as well as males; moreover, a dominant cow can intimidate a subdominant bull. Rank-indicating gestures with head and horns are very common, especially among the top animals. The bison tail is also very expressive. As Milo J. Schult and Arnold O. Haugen, experienced observers of contemporary bison under all imaginable conditions, put it:

*An observer can get some idea of a buffalo's state of mind by looking at the position of the tail. When undisturbed, the buffalo's tail hangs down or flicks back and forth occasionally to get rid of a pesky fly. When*

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*mildly excited, the tail is raised somewhat; the greater the degree of excitement, the higher and more rigid the tail posture. Such excitement is frequently accompanied by defecation. Finally, when fully aroused and combative, the tail is held in a rigid, upright position. It is at this time that the observer should be most wary.*

The fly-whisk function is important; like other large grazers, bison are bothered by a variety of flies.

Considering their size and weight, bison are remarkably light on their hooves. They can scramble up steep slopes quickly, and it is frequently said that they can jump over a six-foot fence from a standing start. They can scratch their shoulders or face by delicately bringing a rear foot forward. They enjoy licking and grooming themselves and other bison. And they love to frolic; young animals especially often simply run about aimlessly, mock-mating, play-fighting, and even play-stampeding.

For most of the year, bulls live on the fringes of groups of cows and calves. Individual bulls may wander deep into woodsy canyons, enjoying patches of grass too small to interest the whole herd. Only during the rutting season, in midsummer, do bulls mingle with the cows. The bison mating season is a time of much bellowing, challenging, threatening, and head-to-head butting contests between dominant bulls. Bison skulls are remarkably thick in the forehead area, which is covered with a heavy pad of fur, and the horns are curved in such a way that frontal butting does not usually involve goring. A fight normally ends with the weaker bull backing away and trotting off. Here nature seems to be aiming for genetic sorting but not death; a few dominant bulls, who intimidate all the others, mate with the cows. Only in captivity, where one bull can get cornered, do fatal fights seem to be common.

A bull who has just been dominated by another bull seems to “work off his frustration” by roaring, pawing the ground or even goring it, and wallowing—lying down and rolling back and forth vigorously, often in a dusty depression that is also used for insect-control wallowing. A dominant bull patiently “tends” a cow in whom he is interested, staying close behind or alongside her for many hours, or sometimes even several days if necessary.

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During this time he fends off the approaches of other bulls, occasionally rests his chin on her rump, does a certain amount of sniffing and licking, and waits until she is ready to be mounted. In this process, he smirks at her in a stylized, neck-extended grimace called the lip curl, the precise function of which nobody—except, presumably, the bison themselves—really knows.

Most calves are born in late April to mid-May following a nine-and-a-half-month gestation period. Whereas the coats of adult bison are varying shades of dark brown, the calves are bright orange-rust and remain so for about three months. Initially, they have no humps. They weigh between thirty and seventy pounds at birth and are extremely winsome. A bison cow is ferociously protective and allows nothing and nobody to get between herself and her calf.

### Our Lost Companions

Among the Indians, bison and many other animals were treated in stories and in life as beings who spoke, felt, and thought much as humans do. They were an equal part of the universe, deserving of careful attention, respect, and love; they were spoken of in the same terms as were family or clan members. And animals were to be seen everywhere—close outside the villages or camps, just over the hills, coming down to drink at the streams. (Bison wore deep trails leading to riverbanks.) Not a day passed without important interactions between humans and other species. This constant contact is hard for moderns to imagine. For most of us, animals are merely an industrial resource. Cattle and poultry are produced out of our daily sight, and we consume them in processed forms that are carefully rendered unrecognizable; to acknowledge that our steaks or drumsticks come from fellow beings would be too painful.

We are distantly aware of wild creatures inhabiting landscapes we seldom visit—parks and wilderness areas, where deer and bears and eagles may occasionally be seen—but these creatures do not qualify as part of our “real,” everyday lives. We count ourselves lucky to experience them through nature programs on television.

Thus we modern human beings live in a landscape that is, by the standards of our long history as a species on earth, deprived of our large animal

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companions. Yet we evolved to what we are in close conjunction with these animals, over millions of years. On some deep level we must miss them, for they gave the human world spiritual meaning as well as sustenance. When we came to dominate them almost completely, and subsequently wiped many of them off the planet, we lost essential evolutionary partners, and we are the lonelier for it. Their absence is our loss, psychologically, spiritually, and morally, and it is felt by many besides Indians and poets. If you go to a zoo—a melancholy experience in the eyes of many—and watch the human animals there, especially the children, you may see in their eyes some recognition of our fundamental comradeship with wild animals.

There are people, and I am one of them, who believe that the natural landscape with its full range of inhabitants can be restored in protected areas. There we can bring back in meaningful numbers the great carnivores who evolved with humans as the top predators in North America: grizzly bears, wolves, mountain lions. Through the devoted efforts of conservation biologists and their allies we may yet manage to preserve large enough wild areas to guarantee the survival of small remnants of these magnificent species—like us, predators who occupy the tops of complex food chains.

But in realistic terms, the bison is the only large wild animal with whom there is any prospect of sustained coexistence on mass terms. (With bison would naturally come smaller numbers of the other species that share grassland habitats with them, chiefly pronghorn, elk, mountain sheep, and deer.) Bison do not fear humans, and a modest level of human activity does not make an area uninhabitable for bison, as even very limited road-building, mining, or timber cutting do for bears. We can, therefore, share land with bison in a way we could not with most other large animals. The possibility of our coexisting with bison opens up some novel and exciting prospects for conservation biology (the new field which applies biological science to species preservation), for land management, and for ranching. It also challenges us, as we will see later, to imagine new relations between ourselves and wild nature.

In about a quarter of what is now the contiguous United States, bison prevailed as the most numerous, the most impressive, and also the most useful members of the animal kingdom. We will not see huge migrating



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herds, but it is reasonable to predict that in fifty or a hundred years, a mere moment in the bison species lifetime, there will be millions of these mighty lords of grass again. A large ecological detour will have been completed, and one part of the United States, at least, will have been restored to a naturally sustainable state.

### Land, Rivers, and Climate

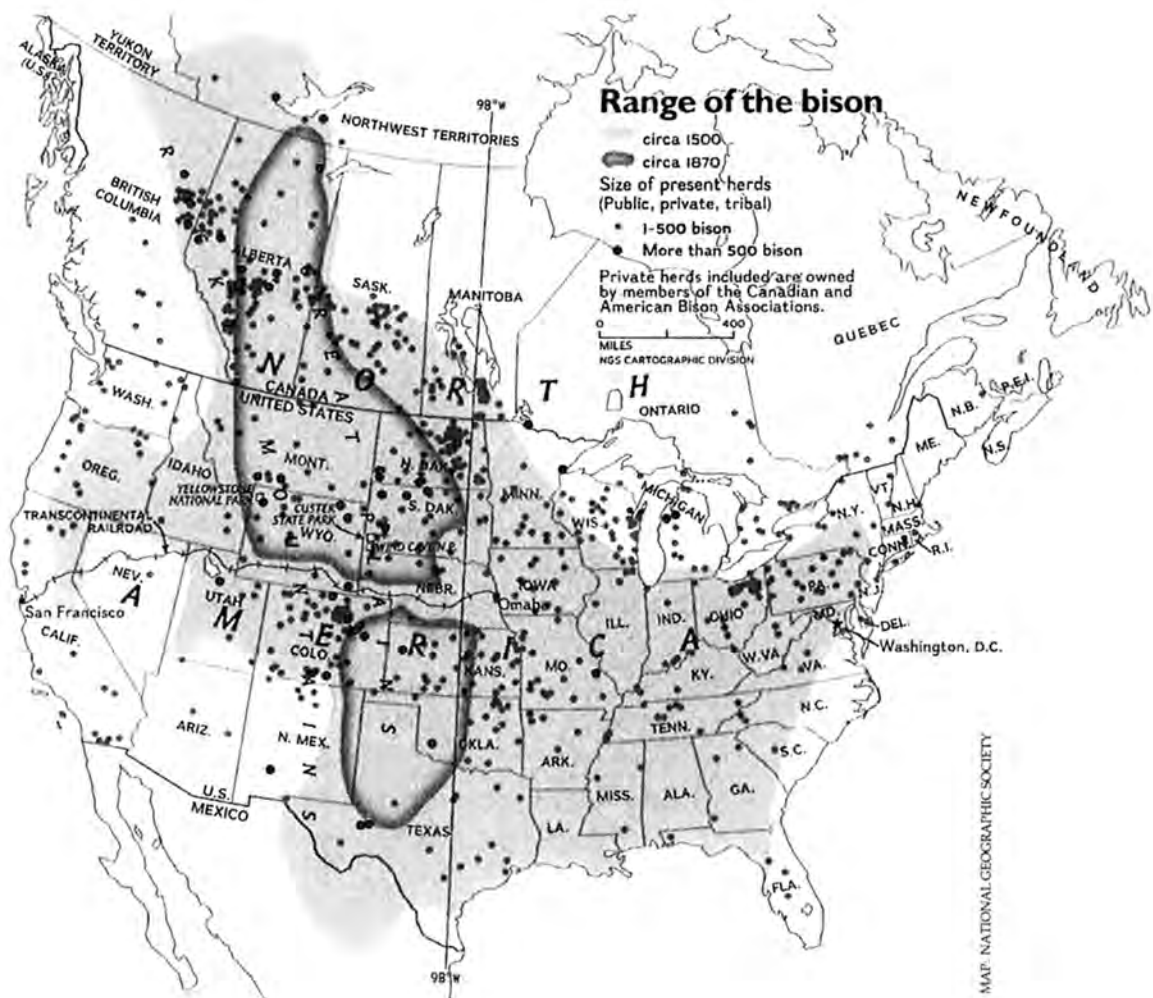
*"In the long run, land determines."*

—Wes Jackson, *paraphrasing John Wesley Powell*

Bison once ranged over a much larger territory than the Great Plains, which many still think of as bison's sole ancestral home. All the tallgrass prairies just to the east, with better soil and more rain, were bison territory too, and the richer forage of this region must have supported the densest herds. (The general quality and particularly the protein content of grass depends directly on rains, especially spring rains.) But bison also inhabited areas where forests were dominant, since they can browse on leaves as well as graze on grass. There were bison as far east as the Appalachians, where I grew up; perhaps out of some deep folk memory, my hometown baseball



After a bout of grazing, bison loaf, often lying down to chew their cuds and rest.



team in central Pennsylvania was called the Boalsburg Bisons. When English settlers first arrived in Georgia, they encountered “innumerable” bison. There were bison in Mexico, in Texas, and on up through Canada to the Yukon. There were bison in the Rockies, as there still are—in Yellowstone National Park; at the National Bison Range in Moiese, Montana; in Grand Teton National Park; and on the Flying D Ranch in Montana, owned by media magnate Ted Turner. However, they never spread in significant numbers through the dry and inhospitable Great Basin into the lush country along the West Coast.

Nowadays, you can find small, thriving ranched herds of bison everywhere in the country. But their heartland remains the Great Plains, and that

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is where we are likely to see, in coming decades, the greatest resurgence of bison herds. There land is cheap; most of it is unrewarding for farming. But it was home to the bison, and it will be again. The Plains are high, dry, gently rolling country, and until white occupation they were entirely covered with mixed native grasses, including the grama grasses which were the main sustenance for the bison. Originally the Plains were treeless except for cottonwoods and willows along the streams. In some sections, like the Sand Hills of Nebraska, the predominant impression of the region as you move through it is rather like being at sea; you think that once you crest the next rise you will gain a view of a broad vista and get your bearings, but in reality all you see from the rise is a new series of rises. In the absence of mountains or other massive landmarks, early white arrivals, like the Indians before them, relied on the rivers for orientation; without them, they would have needed to use compass and sextant, like seaborne navigators.

It is easy to confuse the Plains with the neighboring prairies to the east. The two domains do not divide sharply along some boundary line; nor is their topography uniformly different. They are defined by rainfall and soil types, both of which have local variations. In a general way, we could say that the prairies extend through the great, mostly flat central valley that occupies the middle of the country to the edge of the eastern woodlands, which in historical times covered much of the country east of the Mississippi River. Westward, the prairies extend at least through the first tier of states west of the Mississippi and give way to the drier, sparser Plains in the Dakotas, Nebraska, Kansas, Oklahoma, and Texas. From there, the Plains run to the Rockies, and within the Rockies there are basins that have a predominantly Plains character. On both Plains and prairies, local differences in landforms, stream patterns, soil and vegetation, and temperature made life easier or more difficult for bison. But throughout this vast area, bison roamed free, occupying what ecologists call their niche—their special place in the great panorama of life.

### The Soil and Under the Soil

To people who think that grass is just grass, the Plains and the prairies offer an unknown new universe. Short (six to twelve inches tall) buffalo grass,

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hairy grama, and blue grama grow on the driest, short-grass Plains. On the rainier eastern prairies, Indian grass, big bluestem, and switchgrass reach heights of six to twelve feet. The mixed prairie in between has western wheatgrass, little bluestem, and sideoats grama. All these grasses intermix to some extent, depending on local conditions of soil and moisture, so there is no rigid division of grass types. An undisturbed grassland is a thing of underappreciated beauty. As Lynn Jacobs writes,

*Prairie grassland usually contains an average of 125–150 plant species and numerous animal species. Here one finds many different grasses and flowering plants. Perennial forbs [nonwoody but nongrass plants] are widespread, especially members of the sunflower and legume families. Annuals typically comprise less than 5 percent of plant species. Thick stands of bushes and trees commonly line drainages. . . . While generally less biotically diverse than the bunchgrass community, prairie grassland usually has many more individuals and a much greater biomass per unit of area. . . . Indeed, grassland generally has the deepest, most fertile and productive soil, highest erosion resistance and water retention, and greatest biomass of animals of all the major bioregions.*

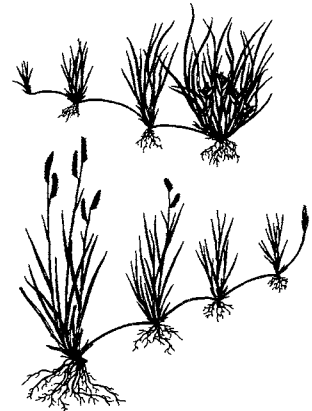
Plains and prairie soil, like soil everywhere on the planet except in the driest deserts, is home to countless small organisms whose total subsurface mass is much greater, for any given natural area, than that of the more visibly imposing large mammals aboveground. Studies carried out on the prairies have counted nematodes, which are small roundworms with teeth, and found that they number a half million per square foot; they consume more of the region's basic biological productivity than do the cows or bison that tramp over them. (Subsoil life thrives better, research shows, when the grasses are grazed.) But even these amazing numbers are dwarfed by the numbers of microorganisms. A pinch of fertile agricultural soil weighing one gram may contain more than 2.5 billion bacteria; 400,000 fungi; 50,000 algae; and 30,000 protozoa. It is these microscopic beings that convert nitrogen, phosphorus, and sulfur in the soil into forms that higher plants

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such as grasses can utilize. Thus, without these microorganisms there could be no plants, no bison, and no humans. Moreover, they decompose organic matter such as dead grass leaves and stems and animal droppings, releasing carbon dioxide and water into the soil and leaving a residue of fine particles that we call humus, the buildup of which has, in fact, created the deep prairie soils. Thus, in a full biological perspective, life under the soil surface is more critical, complex, and massive than is the life visible to us. This is particularly true of Plains and prairie native grasses, which have larger parts underground than aboveground.

Once the bed of an inland sea, the Plains owe their basic slope and elevation to sediments washed down from the Rocky Mountains. Their nearest counterpart is the Russian steppes. Precipitation is skimpy and erratic, running around 20 inches or less per year; in recent years it has averaged 13 inches in northwestern Montana, 16 inches in west-central North Dakota, 17 inches in southwestern South Dakota, and 19 inches in Oklahoma. But multiyear droughts are the norm, and attempts to plow the land, which was originally protected by a thick cover of remarkably deep-rooted, dense grasses, have sooner or later led many farmers to disaster. The soil itself is fertile, and wheat is still a major crop, along with a drought-resistant sorghum called milo; indeed, the Plains still produce most of America's wheat exports. But plow agriculture using annual monocrops like wheat and corn leaves the soil between plants unprotected and is a permanent invitation to erosion.

Throughout the world, erosion by wind and water has been dangerously depleting overgrazed grasslands, causing desertification and lower productivity for human purposes. In America, just as in less-developed countries, we "mine" soil by letting it wash downstream to the oceans. This erosion process is far advanced everywhere in the country, including the deep-topsoil area of the Midwest. It is also severe on the dry, windblown



*Buffalo Grass\**

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Plains grasslands. Even in those extensive Plains areas that have hardly been plowed, where most of the grasslands are used for cattle raising, degradation due to overgrazing is depleting the land. As we will see, bison are part of the solution to erosion problems.

### Bison and Grassland Ecology

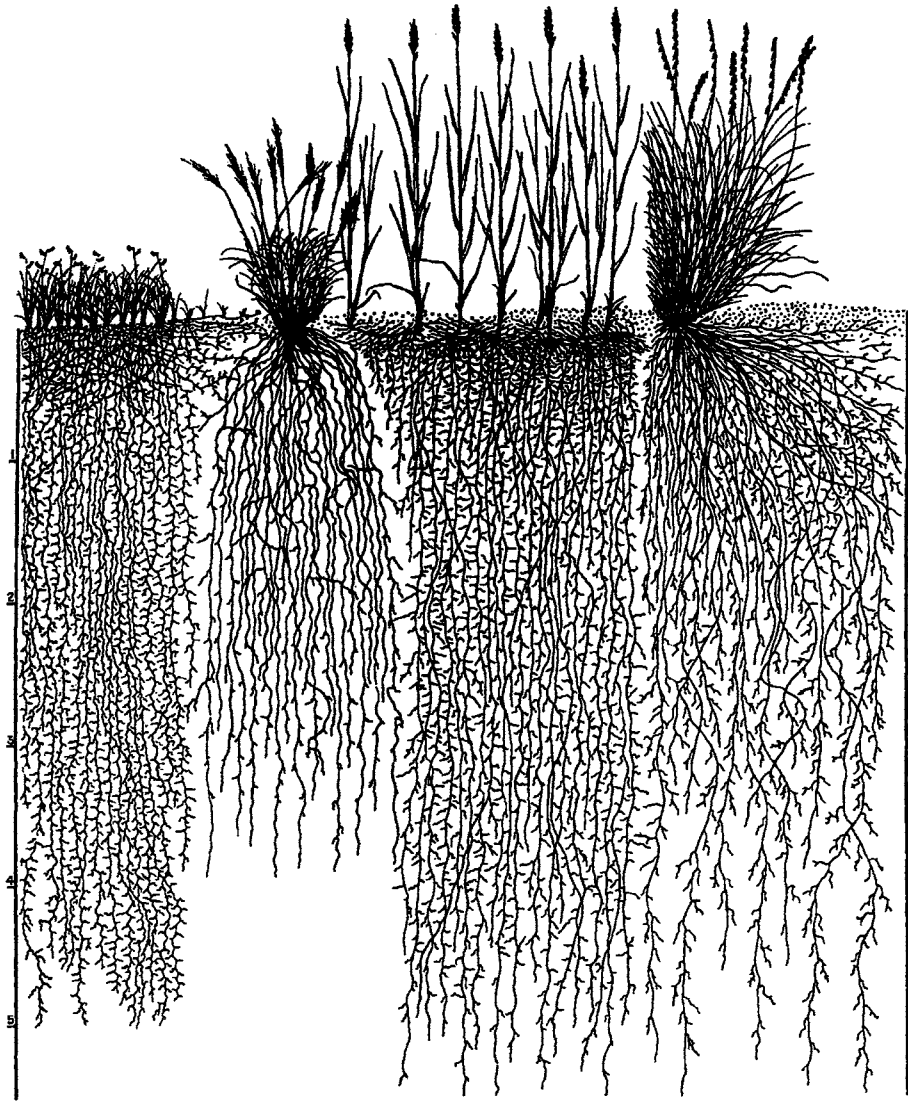
*"Grazing large herds of bison in large pastures represents a cost-efficient method of cropping native vegetation, maintaining a functional ecosystem, providing local employment in an industry that is indefinitely sustainable, and providing a healthier meat."*

—Craig J. Knowles, wildlife consultant

It is the working theory of The Nature Conservancy's preserves in Nebraska and its just-opened preserve in Oklahoma that bison grazing, together with the effects of occasional fires, will tend to bring back native grasses and lead to a stable ecosystem. The process has also been the subject of research at Custer State Park in South Dakota, at the Konza Preserve of Kansas State University, and elsewhere. In recent years, small, museum-like preserves of native grasses, harbingers of more extensive future restoration, have been established through the persistent efforts of volunteers. The most remarkable of these preserve "islands" is within the giant circle formed by the nuclear accelerator at the Argonne National Laboratory outside Chicago. Another lush example is found on the grounds of the Kauffman Museum in Newton, Kansas. These precious areas nurture an incredible richness of species compared with the desolation to which most Plains and prairie grassland has been reduced. One writer noted their "scintillating interdependence that constitutes a single living whole."

Devoted souls who care about bringing back the native grasses can be found everywhere. In Chicago, they have banded together in a loose organization called the Wild Onion Alliance. ("Chicago" comes from the Indian name for a wild onion, and the city and its surroundings have a surprising number of vacant spaces suitable for restoration.) Such people set a powerful example and issue effective appeals for physical labor and vigilance from a large force of concerned citizens. Each community, they say, must

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When researchers excavate the root systems of grasses, they find that they penetrate to extraordinary depths. This drawing shows the tops and roots of dominant grasses common to mixed prairie: from left to right, buffalo grass (which is similar to blue grama), purple three-awn, western wheatgrass, and sideoats grama. Depths are in feet. Reprinted from *Prairie Plants and Their Environment: A Fifty-Year Study in the Midwest*, by J. E. Weaver, by permission of the University of Nebraska Press. Copyright © 1968 by the University of Nebraska Press.

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develop its own “prairie consciousness” in order to push back the concrete, the alien bluegrass lawns, and the cornfields. After ten years of hard work, they have brought back a forest preserve north of Chicago to its ancient state of viability through persistent seeding amid existing vegetation, a method they have found to work better than plowing and planting anew.

There are now such fragments of restored prairie in many states—too small to support bison, but inspiring examples of what can be done. Unfortunately, the extraordinarily labor- and money-intensive work that has gone into these experimental and educational plots is too expensive and demanding to be applied on a regional scale. But The Nature Conservancy hopes that the cropping of grasses by bison, who tend to bite off the top parts of grass rather than tear away the near-ground growing shoots as do cattle and sheep, may aid the recovery of native grass species that cannot survive under livestock.

Native grasses are adapted to occasional heavy grazing, and many grasses actually grow more vigorously when grazed. A free, nomadic bison herd might graze a given grass area one year but not return to it for several years. The constant pressure of fenced and maximum-stock grazing, however, has tended to favor grasses of European origin.

The effects of fire were also undoubtedly crucial to maintenance of the original grasslands. Some fires were induced by lightning and others were set by Indians. Periodic fires, though many researchers like to classify them as disturbances, clean out dead grass materials that do not decay rapidly in dry climates and return them as ash to the soil nutrient cycle. They also create ecological mosaics—spotty patterns where different plant species offer different habitats to different animal inhabitants. Fire stimulates the germination of certain seeds. It is well documented that after a fire, a new round of more productive growth begins, offering new, protein- and energy-rich shoots that please grazers. Fire may even help to prevent outbreaks of pests and plant diseases.

Scientists like Al Steuter, who is in charge of the bison at The Nature Conservancy’s Niobrara Valley Preserve in Nebraska, have worked out the sequence of what they call patch dynamics. An area that bison have been lightly grazing accumulates more dead grass and is thus prone to fire. After