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## Bison as Engineers of the Prairie Waterscape

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*Dust Bath, Bison Style*  
Dave Leiker

## BISON AS ENGINEERS OF THE PRAIRIE WATERSCAPE

Western science has only relatively recently begun to appreciate many of the far-reaching and cascading impacts that the complete removal of a species can have on an ecosystem.

For example, recent research has shown strong linkages between the reintroduction of wolves and elk browsing behaviors, which, in turn, have affected willow and cottonwood recruitment, beaver populations, and stream form and function in Yellowstone National Park. Similarly, the influence of American bison (*Bos bison*) as prairie ecosystem engineers extends not only to healthy grassland maintenance, but also to healthy prairie streams and aquatic ecosystems. The unique behavior patterns of bison impact the prairie landscape and waterscape in ways different from cattle.

For example, bison behaviors may benefit stream and riparian habitats, and, as a result, native fish populations. Compared with cattle, bison are more heat tolerant as a species and rarely seek to wade in streams or ponds. Bison also prefer open grasslands and tend to avoid treed stream corridors, while cattle prefer the shade provided by them. These behaviors have divergent impacts on water quality, especially the amount of silt and soil (sediment) suspended in the water. Research carried out at the Konza Prairie Biological Station found that sediment levels in streams in intensively cattle-grazed areas were three times higher than sediment in streams in bison-grazed areas. The greatest difference in sediment concentration between cattle-grazed and bison-grazed

treatments occurred during the hottest days, and also during the hottest times of the day, as more cattle sought relief in streams and the shade of treed stream corridors. This is significant, given that sediment pollution is one of the greatest threats to Great Plains streams and aquatic ecosystems. Increases in sediment have been associated with decreases in invertebrate communities and native fish species. Many of our native grassland fish species, such as the Topeka shiner (*Notropis topeka*), are not well adapted to muddy, turbid waters, and we are losing them to fish that are more tolerant of these conditions.

Depressions formed by bison wallowing behavior create ecosystem components that benefit aquatic organisms and plant diversity. Wallows are formed by frequent, repeated wallowing in one spot by herd members. Because of soil compaction created by this behavior, wallows often retain rainwater longer than the surrounding prairie, creating temporary wetland habitats.

These temporary bison wallow wetlands may have been historically important to the life histories of frogs, toads, salamanders, and insects and other invertebrates in the Great Plains.

Their presence is especially important in upland areas, where wallows are the only naturally-occurring freshwater habitat.

Wallows also function as soil disturbances, which allow important prairie plants to establish themselves among the highly-competitive perennials. Research has found that the soil disturbance, soil moisture, and additional nutrients available in wallows increased plant species richness and diversity. Consequently, prairies grazed by bison have higher plant species diversity than grazed prairies lacking wallows.

The position of bison as important components of the ecology of Great Plains grasslands has also made them an integral part of the human story. Bison have a central role in the spirituality and culture of the Great Plains tribes. Their importance as a source of food and fur is well-documented. However, it has also been found that several of the edible and medicinal plants traditionally utilized by Native people on the Great Plains are associated with bison wallows. Many of these cultural plants are forbs, which thrive in bison-grazed areas due to habitat provided by wallows, as well as the dietary preference of bison for grasses. As stated by Shoshone researcher Jason Baldes,



*Spiral*  
Diana Werts



“Establishment of bison is much more than a standard wildlife reintroduction, but restoration of Native food and medicine traditions.”

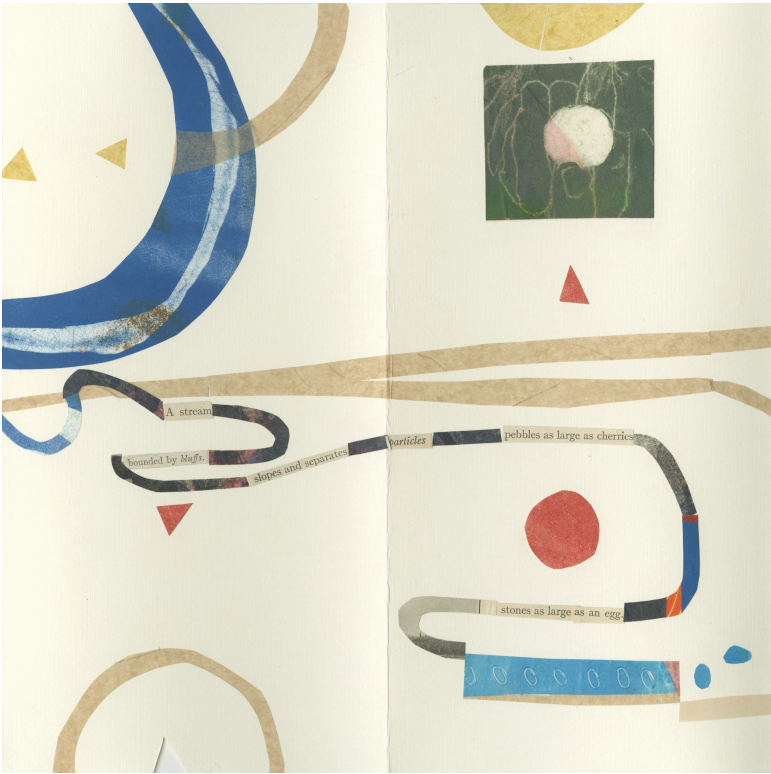
Our grassland streams and rivers are some of the highest-quality bodies of water remaining in Kansas. A recent analysis conducted by the Kansas Department of Health and Environment identified six high-quality “heritage” streams in Kansas, all of which are located in healthy grasslands of the Flint Hills and Red/Gypsum Hills. Protecting, restoring, and sustainably managing our grasslands will ensure that our native aquatic populations thrive, while preserving clean water sources for people and agriculture. Bison are clearly an important element in the restoration and management of prairie grasslands, a relationship that can be attributed to the fact that bison evolved within the Great Plains and, relative to cattle, are better adapted to the local climate. Understanding this relationship is especially important in the face of rising global temperatures, as we seek to minimize impacts to our natural resources.

Bison have been reintroduced at the Konza Prairie Biological Station, Tallgrass Prairie National Preserve, as well as an increasing amount of private land.

However, their numbers are still a fraction of a percent of cattle numbers in the region. This means that restoration and protection of the prairie landscape and waterscape will need to be achieved with cattle as the major grazing ungulate. It is still possible to have healthy streams in cattle-grazed landscapes, and many farmers and ranchers are already demonstrating good stewardship by providing off-stream water sources for their cattle. Where it is possible, however, restoring and conserving bison in their native grassland habitats will have positive impacts that cascade from the grasses and forbs to the streams, fishes, frogs, invertebrates, and human well-being. Bison are more than just charismatic megafauna – they are a key species in the functioning of Great Plains prairie landscapes and waterscapes.

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*The Ordinary Channel, pages 4-5*  
Mary Gordon