Salt Licks and Long Hunters: An Environmental History of the Plains Bison East of the Mississippi River

Honors Thesis

Presented in Partial Fulfillment of the Requirements for the University Honors Program
Colorado State University

By

Jake Matullo
Warner College of Natural Resources

Advisor: Sarah Zwick-Tapley, M.F.A., University Honors Program
Co-Advisor: Sunshine Swetnam, Ph.D., Warner College of Natural Resources

Fall 2025

Abstract

From the 1500s to the early 1800s, hundreds of thousands of bison once lived east of the Mississippi River. This was due to two principle reasons: the clearance of forests by Native Americans for agriculture, and the devastating decline of those same Native Americans at the hand of introduced Old World diseases. With greater open space and reduced hunting and habitat pressure from people, bison crossed the Mississippi and expanded from the Prairie Peninsula into many areas of the east. There, they affected the environment in remarkable ways, such as by improving grassland biodiversity and creating navigable paths in dense forests. Not only did many Native American societies use these paths for travel, but they made various different clothes and tools out of bison as well. Europeans and Americans hunted bison as well, primarily for their meat and hides, ultimately driving them to extinction in the east. Now, many different bison herds have been reestablished out east. However, do they even truly belong there?

Introduction

The history of the bison in America is one many Americans are likely familiar with. An infamous story of human greed and arrogance, the wanton slaughter of the plains bison (*Bison bison bison*, henceforth "bison") serves as a sordid reminder of the dangers of thoughtless overhunting, habitat loss, and the lengths the United States government went to subjugate its Native American population. Yet, in a part of the nation few knew once comprised a portion of the bison's home, its story is even more fascinating, complicated, and tragic. Out beyond the Mississippi River (henceforth known as the "east"), in the Midwest's Prairie Peninsula, the Ohio River Valley, and the Piedmont, hundreds of thousands of bison once roamed. From deciduous forests to open prairie, bison made a lasting mark on the region in ways that few people may realize. Their diet, foraging habits, and behavior improved local biodiversity, created navigable pathways in forests for both human and animal usage, and help create more open space within the heavily-forested region. Native American tribes in the east – such as the Chickasaw and Miami – utilized different methods of hunting bison, and made various clothes and tools from its products, just like the tribes of the Great Plains. Early European explorers and American pioneers hunted bison for their hides and meat, which ultimately led to their total demise in the east.

The fact that this mighty animal – which once thundered across much of the continental United States – could be so heavily reduced in population that its presence in a part of its former territory has been nearly forgotten by the popular imagination speaks volumes to how devastated the species truly was. Part of this relates to shifting baseline syndrome, a phenomenon we will soon go over together. However, the tale of the bison's gradually shrinking range isn't as clearcut as it may seem. Bison were relatively recent newcomers to the east, only beginning to appear in

many parts of the region five hundred years ago, and only as a result of several changes within the eastern environment. Now, after having been extirpated within the first half of the 19th century, many conservation and commercially-managed herds have once again crossed the Mississippi. The question is, can – or *should* – more of them return?

Out from the Plains

A Bison herd crossing a river, *Angus Spech, 2017*

The Mississippi River is one of the longest rivers on Earth. In its lower reaches, it holds enough influence on the landscape to warrant it and the surrounding alluvium its own federally-recognized ecoregion, the Mississippi Alluvial Plains (US EPA National Geospatial Support Team, 2025). Parts of the Lower Mississippi River can be over a mile wide (Google Earth, 2025a). It decidedly isn't the easiest natural feature for an animal that can weigh up to

nearly a ton to cross (San Diego Zoo, 2024). However, bison are able to make that swim, as evidenced in an account by French inspector-general Diron d'Artaguiette in 1723 (Gilbert Roe, 1970). It is also likely that bison didn't exclusively have to cross the Mississippi in order to find new eastern habitat. For thousands of years, bison lived in the Prairia Peninsula, a tallgrass prairie habitat that formerly stretched across Iowa, Illinois, and into eastern Indiana (Mueller et al., 2020).

The earliest signs of bison living in Illinois after the end of the Ice Age date to over 8,000 years ago, with remains from several different bison found in peat deposits. There seems to be a pause in peat formation in the region between approximately 8,000 and 3,000 years ago. Right afterwards, however, the record picks up again. It can be reasonably assumed, therefore, that bison continued to exist within the 5,000-year gap in peat development. Backing this up are two bison that were exhumed from Ottawa in east-central Illinois, with both being dated to 4,300 years before present. Additionally, bison remains were found in the Osceola and Preston Rock Shelter archaeological sites, with both sites belonging to the Late Archaic period (dating to between 4,500 and 2,900 years ago). A total of sixty-seven archaeological sites within Illinois, in fact, have held bison remains. (McMillan, 2006)

Starting around the year 1500, bison began to immigrate to other parts of the east (Belue, 1996). Likely traveling from both the Prairie Peninsula as well as crossing the Mississippi, within a few centuries they were thundering across nearly every state east of the river, notably being absent from New England and most of the Mid-Atlantic. Several factors have been identified as reasons for the bison's expansion. Beginning in the Late Mississippian (circa. 1400 – 1540 AD), different Native American cultures out east began to practice controlled burns much more heavily than in generations prior (Rostlund, 1960; Belue, 1996). These burns were

conducted for a variety of reasons, including the clearing of forestland for agricultural space, to promote the growth of beneficial plants, and opening up the understory for improved hunting (Belue, 1996; Robin & Lake, 2001). In the Piedmont and lowland South, the expansion of low-density longleaf pine forests was facilitated by Native American burns (Belue, 1996). This creation of new, open habitat was well-suited for bison, which quickly began to colonize much of these areas.

However, it is likely that the expansion of the bison's range would've been more difficult had it not been for another, much more morbid factor: the rapid and devastating population collapse of many Native American societies (Rostlund, 1960). As early European explorers traveled along the coasts and made minor inroads into North America, they brought with them Old World diseases. Lacking antibiotic resistance to these diseases due to being wholly unfamiliar with them, Native American populations all across North America – and the rest of the New World – crashed due to the deadly epidemics they subsequently suffered. Additionally, slave raiding by both Europeans and various Native American tribes proved to have just as depopulating of an effect as disease (White, 2018). This decrease in population lessened the hunting pressure on eastern hunting grounds, which gave bison an easier time of colonizing the east (Belue, 1996; White, 2018). Abandoned farmland and population centers also reverted back into prairie and forest, creating new bison habitat.

It should be known that bison didn't appear in their eastern habitats all at the same time. Hernando de Soto, the famous Spanish conquistador, traveled all throughout the South from 1539 to 1542, but failed to many any bison in his accounts of local wildlife (Belue, 1996; McMillan, 2006). In fact, bison were pretty much absent from the historical record in much of the South until the 1670s (Belue, 1996). Paradoxically, Hernando d'Esclalante Fontaneda – who

was a castaway living in Florida between 1551 and 1566 – described Apalachee Native Americans eating “wooly cattle” while he lived among them (Belue, 1996). Further complicating things is the account of Álvar Núñez Cabeza de Vaca, a Spanish explorer who traveled the coastal South in the 1530s (prior to de Soto’s expedition) and described bison existing along the coast (Belue, 1996). Topping it all of is the description of an animal seen by French Huguenots fleeing the 1565 Spanish attack on Fort Caroline (in present-day Jacksonville, Florida), one that almost certainly describes a bison (Rostlund, 1960). However, the former two of these accounts have their issues. The voracity of much of what Fontaneda said in his memoirs has long been questioned by scholars, and the area in which de Vaca stated there were bison was haphazardly mapped, and could range from Galveston – which is east of the Mississippi – to northern Florida. If these accounts are to be believed, it has been suggested that the bison witnessed were early arrivals to the area, and it would be a while until bison herds were much more prevalent in the region (Rostlund, 1960).

North of the Prairie Peninsula lay Wisconsin, the northernmost state completely to the east of the Mississippi River that was home to bison (interestingly, no concrete records of bison in Michigan are known to exist (Gilbert Roe, 1970)). As a land of transition between grassland and forest, it is unknown if they ever ventured into the mixed forests of the north, but were plainly evident in the south and west (Gilbert Roe, 1970). Father Dablon and Father Allouez described herds numbering 400 to 500 each in 1671, and Father Marquette roughly the year prior observed how they would gore and trample men that took shots at them and missed (Gilbert Roe, 1970).

Bison seem to have been fairly absent from the Atlantic and Gulf Coasts. Even when considering de Vaca’s account (which, again, could have been referring to the coastal prairies of

Texas), there are not many records to suggest that they ever frequented coastlines. The closest record of bison to the coast I could find was the death of the last known bison in Georgia, located near the headwaters of the Turtle River (Belue, 1996) approximately twenty miles from the coast (Google Earth, 2025b). This could likely be due to an aversion to marshy habitat, as much of the Atlantic Coast of the United States was once home to extensive swamps and marshland (US EPA National Geospatial Support Team, 2025).

One interesting note regarding the bison's eastern range is the uncertainty over where exactly that range ends in the northeast. As previously mentioned, bison records in the Mid-Atlantic states are either few and far between or completely absent (Gilbert Roe, 1970). In western Maryland, for example, a bison trace-turned-road known as McCulloch's Path once existed, and bison were seen by Father Andrew White in 1632 and John Ogilby in 1680 (Gilbert Roe, 1970). However, little else is known about the species' presence in the state. The same can be said for New York. In 1654, Father Jean De Quens recorded a group of *vaches sauvages* (literally "wild cows") traversing some prairieland south of Lake Ontario (Gilbert Roe, 1970). A pertinent point to make, however, is that many of the terms early European explorers used that sounded like they were describing bison were in fact general terms for large cervids. Case in point, Father Simon Le Moine of the same expedition described how these *vaches sauvages* had horns resembling, "in many respects, the antlers of a stag…" (Gilbert Roe, 1970). Anybody that's seen a bison know that their horns look nothing like deer antlers. While another account does give a pretty incriminating description of bison in the same area (if Thomas Morton's "Lake Erocoise" refers to Lake Ontario, though this is controversial), there doesn't seem to be much else suggesting that bison were ever in much of New York state, other than possibly the tail end of Lake Erie (Gilbert Roe, 1970).

While New York records of bison are scant at best and questionable at worst, there were more observations made in Pennsylvania, except the reported "accounts" of the species are anything but normal. Henry W. Shoemaker, a journalist in the early 1900s, recorded tales of bison from the great-grandchildren of Pennsylvania pioneers (Gilbert Roe, 1970; Belue, 1996). Describing what their great-grandparents had told them, they said that the bison in Pennsylvania belonged to a distinct subspecies from the other bison in the east. These "wood bison" – not to be confused with the scientifically-recognized wood bison, *Bison bison athabascae* – were said to lack the distinct hump and front-heavy build of a plains bison, along with having darker coloration and being well-adapted to living in mountainous regions (Gilbert Roe, 1970; Belue, 1996). They were rumored to have herds numbering into the tens of thousands, and the last herd of approximately 300 was wiped out in Union County on New Year's Eve, 1799.

If any of this sounds suspect, then you would be correct in thinking so. Not only are there no contemporary accounts of the bison within Pennsylvania looking different from other eastern bison, but there is little physical evidence of there ever being bison in Pennsylvania, period (Gilbert Roe, 1970; Belue, 1996). Gabriel Thomas wrote in 1698 in his *An Historical and Geographical Account of the Province and Country of Pennsylvania; and of West-New-Jersey in America* that bison were found in Pennsylvania, but he didn't state the size of their herds. In 1758, Captain Henry Gordon stated near the site of the Battle of Monongahela (a battle in the French and Indian War) that bison could be located, yet he also didn't say how many. A handful of other bison records exist, but the paucity of accounts does not do the legends of Shoemaker any favor. The rumored Buffalo Field, the site of the massacre of the last herd, has never been found (Belue, 1996). Additionally, some of Shoemaker's bison tales were, in fact, plagiarized from an 1808 memoir, Thomas Ashe's *Travels in America* (Gilbert Roe, 1970; Belue, 1996).

That book has been eviscerated by historians for its many, many inaccuracies, with one describing it as “a work which cannot be relied upon for accuracy of detail” (Herrick, 1926). While there is evidence of bison once living in Pennsylvania, however sparse it may be, the idea of there being thousands of a distinct bison variant within the state has no backing.

Canebreaks, Barrens, and Riverbanks

A photograph of a man on a horse in front of a canebreak, *US Department of Agriculture, 1905 or 1906*

As previously mentioned, bison found habitat in the anthropogenically-cleared spaces and abandoned farmlands of the east. However, these spaces weren’t the only locations suitable for bison. One such place, interestingly enough, was just about as opposite as wide-open plains as you could get: dense riverside canebreaks. Canebreaks are dense stands of a bamboo native to

eastern North America, *Arundinaria gigantea* or simply "giant cane" (Gagnon, 2009). Found on uplands adjacent to rivers, giant cane relies on environmental disturbances – such as fire and storms – to create their stands and not get replaced by more closed forests (Gagnon, 2009). They used to be much more prevalent, and were said to be a very expansive habitat by early European explorers and colonists. However, later American colonists decimated canebreak habitat through clearance for agriculture and alterations made to the natural flow and shape of rivers (Gagnon, 2009). These canebreaks proved to be valuable habitat for bison. Their density made navigation difficult by people, and John James Audubon once said that one way a person could move more easily through the cane was to be hunched over and walking backwards (Gagnon, 2009). Interestingly, that to me sounds like it would create a similar shape to a bison's head. Bison already use their large heads to shove aside heavy snow to get to the grass underneath (Hennepin, 1880); naturally, they would be more than capable of using their heads to shove aside cane. This allowed them to dwell within canebreaks, relatively safe from human predation. Bison also feasted on the nutritious cane, a habit well-attested by European hunters and colonists, including Daniel Boone (Belue, 1996).

Other habitats proved to be attractive to bison as well. As previously mentioned, forestland cleared by Native Americans became habitat for bison, feasting on the rich prairie grasses that grew where there was once closed forest. There were also various naturally (or at least seminaturally) occurring tallgrass prairies they found homes in, such as the Kentucky Bluegrass, Big Barrens, and Black Belt and Jackson Prairies (Belue, 1996; White, 2018). Longleaf pine and other flatwood ecosystems – whose open forests rely on relatively frequent wildfires to exist – had their range expanded due to Native American burns, and bison soon colonized them (White, 2018). Bison also frequented riverbanks and sandbars (Belue, 1996).

Father Louis Hennepin, an early French explorer, recorded that pregnant bison swam out to sandbanks within rivers to safely give birth away from predators. Separate accounts from explorers Mark Catesby and George Croghan observed that bison would often lounge alongside rivers to escape the heat of the day. Possibly for similar reasons, bison also occasionally sought out refuge in denser forests (Gilbert Roe, 1970). In an area along the North Carolina-Virginia border, Colonel William Byrd described bison being in a heavily wooded area (Belue, 1996). Overall, bison could be found in a variety of eastern habitats, and not just prairie ecosystems.

Warm-Blooded Tanks

A bison rubbing its head against a tree trunk, *Jacob W. Frank, 2025*

Imagine a battalion of tanks rummaging through an ecosystem, and you can get a rough idea as to the effect bison have on the environment. Large land mammals are well-attested by

scientists to be able to have significant effects on the landscapes they inhabit (Haynes, 2012). As bison churn up the land and vegetation, they are essentially guaranteed to have large and long-lasting impacts on whichever habitats they live in. Some of those aren't super obvious, while others may be visible for miles.

One way bison affect the environment is through wallowing. Referring to the practice of bison rolling on their backs in the dirt, wallowing is an important way bison can groom themselves, repel against insects, give themselves dustbaths to protect themselves against the sun, and socialize with other bison. Within the areas where bison currently live, their wallows are fairly noticeable. Multiple animals weighing hundreds of pounds rolling around in the same spot over and over again, naturally, would reduce the groundcover to a bare patch of dirt within a shallow depression. While these areas may be mostly devoid of life at that time, they won't stay that way forever. Over time, the ground beneath a wallow becomes so compacted that, when it gathers water, it won't drain through the soil and will instead continue collecting water. At that point, the wallow is abandoned by bison, and it becomes a sort of mini-marshland. These abandoned wallows are then colonized by animals that wouldn't otherwise be found in the ecosystem, improving local biodiversity. (Nickell, 2018)

Wallowing isn't the only way that bison can scratch an itch. They are known to rub themselves against rocks, trees, and human infrastructure (Coppedge & Shaw, 1997). Against the latter two, bison also perform what is called "horning," which is where they rub their horns against objects potentially as a display of aggression, to aid in shedding, and insect protection (Coppedge & Shaw, 1997). Bison have been recorded to have a preference for rubbing and horning on small, woody vegetation, but will use trees as well. The effects these behaviors can have on bushes, saplings, and small trees – such as willows and eastern red-cedars – range from

minor damage to fully killing the plant (Coppedge & Shaw, 1997). It can be reasonably assumed that in eastern environments, particularly within woodlands and on the borderlands between prairies and forests, bison would've discouraged the expansion of shrubs, bushes, and trees. Along with the controlled burns performed by Native Americans, it is likely that bison themselves helped facilitate the growth of prairies and open woodland habitats by keeping encroaching woody vegetation at bay.

Arguably the most iconic imprint bison left on the eastern landscape were their traces. Known as "buffalo traces", they've even inspired the name of an acclaimed bourbon distillery (Georges, 2023). These were well worn-paths that snuck through the forests of the east, maintained by the heavy hooves of innumerable bison. They were most ubiquitous to Kentucky, where the highest numbers of bison that dwelled within or adjacent to forests lived (Jake, 1968). The traces led to salt licks, referring to the naturally-forming salt deposits that would dot across the landscape and serve as vital sources of salt for the diets of many animals (Jakle, 1968). They also led from canebreaks and different springs (Jakle, 1968). As you can imagine, the might and weight of an animal that can weigh close to a ton is certain to leave an imprint on whichever landscape it treads upon. Multiply that by hundreds of animals that frequently walk the same paths over and over again, and you will end up with a trail that has highly compacted soil and is decently well-defined. It's possible that, as African forest elephants (*Loxodonta cyclotis*) provide pathways through dense jungle vegetation that various tropical denizens use (Remis & Jost Robinson, 2020), these pathways served other wildlife as well. Being frequently trampled underneath the mighty hooves of bison, they also provided a place for species that thrive in disturbed areas to live (Mueller et al., 2020). And, as we will soon explore, they proved to be useful to more than just the flora and fauna.

The significance of salt licks to the understanding of eastern bison cannot be understated. Unlike the hundreds-strong herds found in the Prairie Peninsula – and far from the rolling tides of meat and fur that stretched out into the Great Plains' horizon – most bison herds in the east rarely ever numbered more than a few dozen. However, accounts of hundreds, even more than a thousand bison at salt licks abound in the historical record (Rostlund, 1960; Jakle, 1968; Gilbert Roe, 1970; Belue, 1996). These were most definitely the result of various bison herds coalescing at locations that were common gathering grounds for the species. It's possible that herds might have even joined in their pursuit of salt licks. Deep within the wilds of Kentucky, Daniel Boone described how he had his back pressed against a tree for two hours as a bison herd passed him by (Belue, 1996). He recognized the changing makeup of the herd as the bison marched past, describing a succession of younger cows and calves, then young adults, then old cows and bulls, and lastly the weak and injured being tailed by wolves (most likely the eastern grey wolf subspecies, or *Canis lupus lycaon*).

At salt licks, the mighty terraforming ability of bison was put on full display. "Stamping grounds" were what the land around salt licks was aptly called by early explorers and pioneers, as the ground had gotten so trodden upon that the ground had become a mire (Belue, 1996). At Drennon's Lick in Kentucky, outdoorsman Nicholas Creswell estimated that 50 acres of land surrounding the lick must have been grassless (Belue, 1996). Their barrenness was also partly due to how the ground would literally be licked by the bison, scooping up mouthfuls of clay and salt-rich earth with their tongues. So much dirt was eaten that, at Blue Licks in Kentucky, three to four feet of soil had been removed, and the roots of large trees were visible (Gilbert Roe, 1970). This behavior wasn't just restricted to salt licks either. In the salty earth near Daniel

Boone's cabin in the 1780s, he described how the bison had eaten a ditch four feet deep (Belue, 1996).

Salt licks have proved to be vital to the scientific understanding of eastern bison. At Big Bone Lick in northern Kentucky, the remains of fifty-four bison from a single herd have been excavated. Not only did analysis of their bones prove that bison were in the area between 1270 to 1640 AD, but dental analysis of their teeth showed that they ate woody plant matter as well (Widga, 2006). This suggests that bison were more adept at living within forested environments than one might think, and that their diet was not restricted to their conventional diet of grasses (Mueller et al., 2020; Ratajczak et al., 2022) and giant cane (Belue, 1996).

When bison did eat grass, they left as much of an impact on prairieland as they did in forests, if not more. Bison, unlike the cattle that has more or less replaced them across much of their former range, eat a lot more grass than they do forbs (Mueller et al., 2020; Ratajczak et al., 2022). Forbs are basically flowering herbaceous (i.e not woody, like a tree or bush) plants, but aren't a grass, sedge, or rush. These plants have deeper roots that reach further into groundwater than many grasses do. As a result, grasslands with many forbs experience a greater availability of and less competition for water between grasses and forbs alike. However, in the absence of large mammalian grazers – especially bison – grasses will typically outcompete them and dominate the plant makeup in a grassland. This grass dominance increases the pressure put on the groundwater closer to the surface, as nearly every plant in the landscape is extracting water from the same level. In prairies where bison are present, they have shown to be more drought-resistant than prairies without them as a result of this increase in forb populations (Ratajczak et al., 2022).

In spite of their landscaping prowess, bison in the east were no different from the prey animals they were back out west. The iconic animal adversary of the bison, colonial accounts by

early explorers talk of how wolves would stalk injured, weak, or lone bison (Belue, 1996). Another predator known to hunt bison were cougars (*Puma concolor*). An observation within the upper Illinois River stated that cougars would stalk bison at salt licks, lying in wait amidst the treetops, before leaping down onto the back of them (Belue, 1996). Daniel Boone himself shot a cougar that was grappling on top of a bison (Belue, 1996). While the sources I've read describing eastern bison don't mention bear predation, a study published this year documented a grizzly bear (*Ursus arctos horribilis*) defending what is presumed to have been its kill of a wood bison calf in the Yukon (Jung, 2025). While the authors note that this was a single incident, they also theorized that grizzly bear predation of bison was likely much more common, at least until most of their ranges ceased to overlap (Jung, 2025). In addition to these predators, the fact that bison frequented riparian areas, and part of its range overlapped with that of the American alligator (*Alligator mississippiensis*) in the east (Somma, 2019), makes me very interested in the possibility that alligators could have occasionally snatched bison that hung around certain lakes and rivers for a bit too long.

Buffalo Robes, Bags, and Shakers

Reconstruction of the environment of the Ottawa bison site, *Bruce McMillan, 2006*

The intensity of bison usage by the Native American societies of the east (also known as Eastern Woodlands tribes) varies with time and tribe. As bison were recent newcomers to much of the east – and existed in much lower numbers – they were absent from the cultural legends of many different groups, such as the Algonquins, Iroquois, and those in the South (Belue, 1996). This doesn't negate the fact that, just as the tribes of the Great Plains did, the tribes of the east hunted and found a variety of uses for bison.

European explorers made note of the bison goods they found in places where bison weren't yet located. As previously mentioned, de Soto and his party failed to find any bison in his travels of the South (Belue, 1996). However, his men did make note of "cow horns" found at a Native American town by the Savannah River (now comprising the border of Georgia and South Carolina), which confused them as they found no cattle in the region (Swanton, 1946). The

existence of these in the region – along with similar goods, such as bison hides they found in Tennessee (Tankersley, 1987) – could have been the result of trade routes stemming from eastern areas that already had bison or areas farther to the west of the Mississippi (Belue, 1996).

Archaeological evidence of bison in the east isn't numerous, but it does exist. The Madisonville site of the Fort Ancient culture, located in the extreme southwestern corner of Ohio, was inhabited between 1450 and 1800 AD. Here, bison pendants have been unearthed, along with beamers (bone tools used for tanning hides) made from bison vertebrae, as well as large amounts of bison bones found in the site's refuse piles (Tankersley, 1987). The aforementioned bison unearthed at Big Bone Lick are theorized to have been killed in a single hunting incident (Widga, 2006). Some of the oldest evidence for bison hunting dates back to between 4,500 to 2,900 years ago, with remains found at the aforementioned Osceola and Preston Rock Shelter sites in Illinois (McMillan, 2006). While bison remains have been excavated from every eastern archaeological stage since the Archaic, their number really took off during the Middle Mississippian, which started at approximately 1300 AD (McMillan, 2006). While part of the increase in bison remains could be due to the concurrent expansion of the bison's range, as mentioned previously, increasingly sophisticated trade networks from all around the nation likely assisted in this as well.

It is worth pointing out that while the archaeological evidence proving the existence of bison out east isn't exactly plentiful, the absence of evidence doesn't necessarily suggest evidence of absence. It's very likely that some uncovered bison bones could've been overlooked or mistaken for other animals (Rostlund, 1960). Complicating things further is the fact that some earlier specimens identified as bison or other animals have been lost and thus unavailable for reevaluation (McMillan, 2006). Additionally, as Western agriculture marched across the

landscape from the shores of the Atlantic, many farmers who unearthed bison bones with their plows and hoes – not recognizing the significance of what they found – very likely just didn't record their findings and simply turned the bones into fertilizer (Rostlund 1960).

Fortunately for us, historical accounts of Native American bison exploitation in the east abound. European explorers, hunters, and pioneers offer many detailed accounts on how Eastern Woodlands tribes would interact with bison. Many nations of the east utilized buffalo traces for travel, such as the famous Warrior's Path in Tennessee (Belue, 1996). A sight seen across much of the east were robes made from bison hides, colored brilliantly from various natural dyes, and were reported to be warm yet lightweight enough to be worn with relative comfort and to be used as bedcovers (Belue, 1996). French explorers in Louisiana observed how the Bayogoula tribe used bison bones as hoes in their fields (Swanton, 1946). Bags (Hennepin, 1880) and blended skirts (Belue, 1996) were woven from bison wool, too. From the hooves of calves, they made rattlers to be used in dancing ceremonies (Hennepin, 1880).

As mentioned before, the novelty of bison in much of the east didn't give much time for the species to be adopted into many local mythologies. However, they did become important aspects of some nations' cultures. James Adair, an English explorer who lived and traded amongst the Chickasaw intermittently between 1738 and 1768, recorded that bison were an important icon amongst warriors. A warrior who had killed an enemy was given the title "Yanasabe," which means "the bison killer." Warriors also sometimes strapped the hooves of bison to their feet in order to confuse enemy warriors about their movement. In spite of the significance of bison to their culture, Adair also decried the Chickasaw for wastefully hunting the bison just for choice cuts, as the species had started becoming rare in the region by then. (Adair, 1930)

Due to a general preference for deer, many Eastern Woodlands tribes didn't hunt bison as heavily as the tribes of the Great Plains. However, there were some that relied on bison more than others. The Natchez, who lived on both sides of the Mississippi River in the modern states of Louisiana and Mississippi, were one of the heaviest hunters of bison. Holding yearly hunts where massive numbers of bison were killed, they hunted bison so much so that by 1700 the animal's range had effectively reached its peak in the east in all but within Natchez land. The territories of the Fox and Sauk tribes, way up in the Prairie Panhandle with its hundreds-strong herds of bison, likely experienced the heaviest bison hunting by any tribes east of the Mississippi. (Belue, 1996).

When hunting bison, many tribes made a conscious effort not to overhunt or "scare" the bison in order to ensure their population stability (Belue, 1996). As bison were theorized to have been an important protein source in some nations (Tankersley, 1987), securing a stable meat supply would've been vital. That being said, some hunts were especially devastating. Traveling through the Ohio River Valley in the 17th century, Hennepin observed how the Miami people held controlled burns that encircled herds and left a small opening, which bison would run through and be cut down under a hail of arrows, their bones left after processing to litter the landscape (Hennepin, 1880). Another hunting strategy is also known to have been performed by the Miami as well as the Kickapoo, Ottawa, and Potawatomi. Hunters would form two lines and creep towards a herd, gradually encircling the bison before pelting them with arrows (Belue, 1996). They would also kill young calves after leading them back to settlements by letting them suckle on the fingers of hunters (Hennepin, 1880). After they had let their children play with them for a short time, they would strike them on the head.

As in the Great Plains, hunting bison was a dangerous task. If one shot at a bison and didn't kill it, it was recommended that the person throw themselves down into the grass, as the bison would charge at them (Tankersley, 1987). When not using ranged weapons, the tribes of the Grand Prairie in Illinois (a part of the Prairie Peninsula) would spear bison on horseback or pounce them on foot with clubs and stones (Belue, 1996). An account taken during the French and Indian War observed how Native Americans drove herds of several hundred bison into massive nets of woven birch bark. They would then have to kill as many bison as they could before the net evidently broke (Belue, 1996).

A fascinating theory regarding bison and the development of agriculture in the east has recently been posited. Some of the earliest evidence for plant domestication out east is found at the margins of the Grand Prairie. The wild ancestors of these crops – called "crop progenitors" – were often forbs or cool season C3 grasses, which are a type of grass that have different growing and photosynthesis patterns than warm season C4 grasses. As previously discussed, bison grazing helps the proliferation of forbs, and the same applies to these types of grasses. Also discussed were bison traces, as well as how various different Native American tribes used them for transportation. With all of these facts considered, a paper published in 2020 proposed an interesting theory. Along these traces, bison would've grazed and created patches of crop progenitors. As people walked along these traces, they would've encountered these patches and harvested them. This likely could've helped spur the start of agriculture within the region. An experiment the authors of the paper conducted even found that two crop progenitors – little barley and maygrass – were found only within a portion of the Joseph H. Williams Tallgrass Prairie Preserve that was grazed by bison. Not only did bison greatly affect the natural world, but

they might even be responsible for a great transition within Native American civilization itself. (Mueller et al., 2020)

Long Hunters and Wild Beef

There was a Man: To Daniel Boone A Buffalo Stampede Was All In A Day's Work, Kenneth Riley, 1949

The coming of Western civilization spelled doom for the eastern bison. Within a few hundred years after de Soto saw those strange cow horns, the species had been completely wiped out in the region. Unlike in the Great Plains, the extermination of the bison in the east wasn't partially a concerted effort to fully conquer the east's Native American population. While overhunting was the predominant cause for their demise, as it was out west, it was the desire to satisfy market demands, to make a living, and sport hunting that killed off the bison (Belue, 1996). However, the story of European and American interactions with bison isn't simply a tale of wanton destruction. It is much more complicated than that.

While the Spanish were the first Europeans to make observations of bison in the east, it was the French who were the first to exploit the species. French *voyageurs* – men who hunted and trapped for furs and skins in the frontierlands of New France – hunted bison for their hides. Encountering herds in prairies, glades, and woodlands, dozens could be shot at a time. Following in their footsteps were English hunters and the American long hunters. Sporting deerskin clothes and Kentucky rifles, the latter are famous in American iconography, owing to figures like Daniel Boone and Davy Crockett. All three groups participated in the bison hide trade, and all three contributed to the gradual removal of the bison in the east (Belue, 1996).

However, in spite of how many bison were killed, it was apparent that they were not the most ideal source of skins. Their hides, though warm and relatively lightweight, were still large, bulky, and difficult to transport in bulk. They were also more difficult to process than other animal skins. Another issue that the *voyageurs* experienced was the difficulty of shipping to Gulf ports for export, owing to navigability issues, Native American attacks, lengthy travels both up and downriver, and storms. It makes sense then that the *voyageurs* and long hunters often preferred smaller beaver pelts, which were much more valuable than bison hides, and smaller deerskins, which were much more common. (Belue, 1996)

However, something the Europeans and Americans quickly realized was that there were other, more profitable uses for bison. Specifically, their meat. Bison tongues and back meat were prized for their taste and texture, and before long "wild beef" began to be sold in markets from the frontier to major cities like New Orleans (Belue, 1996). The best time to get bison meat was in the fall after the bison had their fill of grasses, clover, and pea vine (Belue, 1996). Native Americans hunted bison to be sold to European and American markets as well (Adair, 1930). They were salted, made into jerky, and had their fat rendered into tallow (which is fat that has

been melted down and clarified into a clearer liquid). Within New France, the best cuts were sold in New Orleans, while those of poorer quality were shipped across the Caribbean to be eaten at plantations (Belue, 1996).

A recurring theme among Europeans and Americans in the east was the idea of using bison for reasons other than their hides or meat. Upon seeing bison – with their mighty strength and their curly wool – many wondered, particularly the French, if they could be used like oxen or sheep. Both Hennepin and Monsieur de Remonville wondered if it was possible to rear them from calves into pliable livestock. The French Crown saw the tantalizing prospect that accompanied the idea of a bison-textile industry. Sieur d'Iberville, the commandant of Biloxi, issued a decree calling for the settlers of New France to get busy breeding bison specifically for this purpose. Even prior to this, French Huguenots in Virginia tried taming two bison they had captured in 1702 for the plow. The thing is here, they *tried*. As these Huguenots – along with other European explorers and settlers – soon realized, bison could not be truly domesticated. While they might superficially resemble cows and travel in herds too, they are notoriously dangerous and unpredictable animals. The Virginian Huguenots quickly figured this out and killed the captured bison for their meat. Later, in a letter penned in 1712, Father Gabriel Marest said they couldn't be domesticated due to their unruly nature. While other factors contributed to the idea of abandoning bison as livestock – such as there already being perfectly fine Old World livestock to import and rear – the inherent risk that comes with coming into frequent contact with bison proved to be a decisive factor. (Belue, 1996)

An idea for the exploitation of bison that was slightly more realized was crossbreeding them with cattle. As far back as the early 1700s, the English explorer John Lawson theorized the potential hybrid beef and milk this could create. It was only really after American settlement past

the Appalachians, and the extirpation of bison in the east, did that truly begin. Robert Wickliffe imported bison from the Upper Missouri River region to crossbreed the two species, which he did during the early- to mid-1800s. Others did the same on various estates and farms throughout the east. However, while these individuals were successful in getting the two species to breed, not much else came from the venture. Interacting with bison was, after all, still not very safe, and Wickliffe's hope that doing this would domesticate them didn't come to fruition. While hybrids of the two species (called "beefalo") exist today, and most bison alive today carry some percentage of cattle DNA, no large-scale breeding of bison and cattle would be actualized. (Belue, 1996)

While agricultural uses for bison never panned out, bison proved to be very useful for American pioneers in another way. As priorly mentioned, buffalo traces were most commonly found in Kentucky, and to a lesser extent Tennessee. These traces became very important for the colonization of these two states from the 1770s to the 1790s (Belue, 1996). While some of these paths proved to be difficult to navigate (Gilbert Roe, 1970), others served as easy, readymade methods of travel in what seemed to be virtual wilderness to the Americans (apart from Native American villages). The Wilderness Road, forged by Daniel Boone and became a principal route into the Kentucky frontier, partially followed buffalo traces (Belue, 1996). Other roads, such as the Middle Trace and the Upper and Lower Roads, were also partially constructed on top of different traces (Belue, 1996). Railroads were eventually constructed on top of different traces as well (Haynes, 2012). Some roads built on top of traces, like U.S Route 150 and the Natchez Trace Parkway, are still in use to this very day (Haynes, 2012). It's important to point out that not all buffalo traces were utilized. Aside from rougher ones, the traces that ran in a north-south direction weren't used extensively, as they didn't help pioneers get from the east to the west

(Jakle, 1968). Yet even those north-south traces likely helped pioneers as well, as different traces were also used to help them mark land claims (Belue, 1996). Large cities – such as Cincinnati, Lexington, Louisville, and Nashville – were even built around different buffalo traces (Jakle, 1968).

The initial settlers of the Ohio River Valley relied on bison in other ways as well. Before there was a steady harvest and large supply of livestock, bison provided a lot of material needs. Their beef fed families in the absence of cattle and other conventional protein sources. Their wool was spun into clothes, their sinews were used to make shoe straps, and their hides were made into bags. They even bound books in bison leather, and used their gut strings to make the strings of fiddles. Following in the footsteps of Native Americans, they made comfortable bison robes as well. (Belue, 1996)

In spite of the benefit these traces and animal products provided Americans, they would ultimately remove the animal that provided them in the first place. While Native Americans did begin to more heavily exploit animals for the fur trade (owing to the effects of alcoholism, the end of aid from the British after the War of 1812, and the demise of traditional belief systems), it was ultimately American pioneers that killed off the eastern bison. Stories of bountiful game past the Appalachians, spun into advertisements for colonization of the area, served as the death bell for bison. Many were shot for their meat and other animal products, as previously discussed, but there were other reasons as well. Stabbing a bison and getting away with it to tell the tale was a known feat many frontiersmen tried. Many people shot bison simply because they wanted to say they did. The hunting got so wasteful that Daniel Boone even passed legislation to halt the relentless hunting of game, in particularly bison. While this did help a little, it wasn't enough – especially after bison became agricultural pests after the establishment of farms. They broke

fences, tore up fields by wallowing and trudging through them, and even toppled cabins by rubbing against them. As such, they were shot. (Belue, 1996)

Habitat loss was another lethal means of extermination for the bison. Unsophisticated burns held by pioneers ran rampant throughout the land, burning for miles in the pursuit of clearing land for agriculture or hunting for game. Valuable bison habitat, like canebreaks and prairies, were heavily damaged as a result. Farmers would torch canebreaks specifically to drive bison out of them to be shot. Conversions of prairies, forests, and riparian areas into cropland and pasture was also disastrous, driving bison out of the habitats they had come to find homes in. In fact, canebreaks have all but vanished as a distinct habitat in the east today (Gagnon, 2009). Fences and roads fragmented the bison habitat that remained as well. (Belue, 1996)

It only took a little over a century to completely remove this mighty animal from the east. The bison were exterminated east of the Appalachians first, disappearing from Virginia and the Tidewater region by 1730. It is unclear when bison were removed from the state of Mississippi, but Choctaw oral legend states they disappeared sometime in the early 1700s (Gilbert Roe, 1970). They then were hunted to extinction in Florida, Alabama, and the Carolinas by the 1770s, finally being removed from the Atlantic coastal region by the early 1800s with the death of the last bison in Georgia. In Pennsylvania – if the legends of bison in the state are to be even partially believed – they were fully extirpated by 1801. By 1808 they had disappeared from Illinois and Ohio, and their well-worn presence in Kentucky and Tennessee ended in 1820 and 1823 respectively. They held on for a while longer in West Virginia before being hunted to extinction by 1825. Within Indiana, a part of the Prairie Panhandle they had called home for thousands of years, they possibly lasted until 1830. The last bison east of the Mississippi was reportedly killed in 1832, when Native Americans hunted the last known bison in northwestern

Wisconsin. Through land cover change, gunfire, and fire itself, the largest animal in the eastern United States was wholly wiped out. (Belue, 1996)

Bison in the East Today

Bison come to the fence at Big Bone Lick [Kentucky]*, Cheri Lawson, 2025*

Nature's ability to recover from massive environmental disturbances is more than worthy of admiration. This is plainly evident with the American bison. Once numbering under a thousand and facing certain extinction by the late 19th century, they now are close to half a million individuals and have been reintroduced to wide swathes of their former range – including many areas out east. This work was pioneered by private individuals, early conservation groups, and the government, who stationed troops within Yellowstone to protect bison from poachers.

Once shot by the hundreds, they are now a cherished American icon, as well as the United States' national mammal (NPS, 2024). (Sanderson et al., 2008)

However, the status of bison is a far cry from what it once was. Even though they don't currently face extinction, that metric alone isn't enough to qualify the health of a species. The IUCN Green List does precisely this, emphasizing the importance of restoring a species to its range as well as its role within its native ecosystems (IUCN, 2021). As such, bison are considered "critically depleted," owing to the total absence of bison from the vast majority of its former range (Rogers et al., 2022). Reintroducing bison is complicated by the risk of increasing brucellosis transmission, a disease found in many bison herds that causes the premature births of calves in both bison and cattle (Sanderson et al., 2008), as well as the lack of available public land that is adequate for bison reintroduction (Martin et al., 2021). In the heavily-populated east, the latter problem is especially troublesome. Of the bison that are around, the historic estimates of thirty to sixty million wild individuals are leaps and bounds ahead of the current population of 500,000 closely-monitored, mostly enclosed bison (Sanderson et al., 2008). Most of these bison – an estimated 85% – are not considered "conservation herds," meaning that they are not managed for the species' preservation and genetic integrity. Rather, they are "production herds," reared for their meat or fur (Martin et al., 2021).

As the team behind Sanderson's paper pointed out, "considering the entire ecological range bison once occupied allows a larger group of people to share the benefits of bison conservation" (Sanderson et al., 2008). That is what the Vermejo Statement, a guideline created at a 2006 summit for bison, wishes to achieve. It aims to have large, free-roaming herds of bison in each of its historic habitat types by the end of the century, including those out east (Sanderson

et al., 2008). If more people knew that their backyards were once home to bison, they'd more likely support this goal and want them back.

Yet many Americans in the east simply don't know that bison used to rumble through their neighborhoods. This is due to something known as shifting baseline syndrome. This refers to the phenomenon where people's perceptions of what is natural in the environment isn't actually a reflection of what is truly natural, but rather what the environment has become due to anthropogenic changes that were made long ago (Sanderson, 2019). For example, people would typically think of lions as to not being native to Europe, yet they had actually lived all throughout the Balkans until a little less than two millennia ago (Sanderson, 2019). This resulting generations-long absence warped people's perception of where a lion should naturally be found in. The same logic applies to bison in the east as well. Having been wholly absent from the region for almost two full centuries, many people grew up without ever seeing a bison in its former stomping grounds. My dad, who grew up in Illinois – the state where herds of hundreds of bison once roamed across the tallgrass prairie – never knew they used to live there until I told him.

Shifting baseline syndrome risks truncating reintroduction efforts, as the chosen habitats for species reintroduction – owing to what people perceive as the native habitats of the species – may not be all the habitats the species had previously dwelled in (Yeo, 2024). However, there's more to the issue here. As we have discussed, bison weren't found in much of their eastern habitat until roughly five hundred years ago. This was due to the two identified reasons: the opening of forest for agriculture by Native Americans, and the devastation of those Native Americans from Old World diseases. Both of these offer conflicting implications surrounding bison. The former suggests that bison were never meant to belong in the east, as their

introduction to the region was the result of anthropogenic land use change. The latter, meanwhile, suggests that humanity was keeping bison from inhabiting a place they otherwise would have been. This is especially intriguing given the dental analysis of the aforementioned Big Bone Lick bison remains, which shows that their diet was partially composed of woody, forest-dwelling vegetation. Maybe the forests and meadows of the east were a suitable (if not exactly optimal) habitat, and hunting pressure was the key factor that kept bison from living within them.

One might point out that, even if bison were never meant to be out east, they proved beneficial to the biodiversity of the prairies and meadows all across the region. But did this come at the expense of forest-dwelling species? Did the bison's facilitation of keeping grasslands open limit the amount of habitat that otherwise would've gone to plants that need light-limited conditions, as well as the animals that dwelled amongst them? Did their trampling not disturb plants unaccustomed to herds of large mammals traveling over them? It's difficult to know for certain, especially when considering another complicating factor: the wood-pasture hypothesis. Also dubbed the Vera hypothesis after the biologist who created the hypothesis, it suggests that the natural landscape of Europe should have large tracts of woodland instead of mainly dense forest, owing to the behavior of now-absent Ice Age megafauna (Sandom et al., 2014). This hypothesis can also extend to the Americas, where much of its Ice Age megafauna – mammoths, mastodons, ground sloths – went extinct as well. If this hypothesis were true, then this suggests that bison would be partially fulfilling the ecosystem roles of animals that have been hunted to extinction. They would be transforming the east's landscape into a resemblance of what it should naturally look like, rather than warping it into an unnatural state. However, to add further uncertainty, this all hinges on the assumption that the extinction of much of the Pleistocene

megafaunal pantheon was predominantly due to human activity, a belief that is still hotly debated within scientific circles (Stewart et al., 2025).

It is impossible to truly know what the true range of bison would be without human influence, as well as what the true natural state of the east should be. Yet this hasn't stopped reintroduction efforts out east. Dozens of herds have been established in the region, with many being clustered in Kentucky and, ironically enough, Pennsylvania (Sanderson et al., 2008). Saving Animals From Extinction – a framework founded by the Association of Zoos and Aquariums – explicitly states in their program plan for bison that, in accordance with the IUCN Green List, they want the species reintroduced in its former habitats from coast to coast (Association of Zoos and Aquariums, 2025). Aside from increased genetic and habitat conservation, the federal government also recognizes the need for further cooperation between on-the-ground conservationists and different stakeholders all across the nation, such as private managers, non-governmental organizations, and tribal organizations (US DOI BWG, 2020).

Part of this is envisioned process would be done through what has been called "rematriation." This refers to the reestablishment of sacred connections between indigenous peoples and the land they inhabited (Association of Zoos and Aquariums, 2025). While this can be done in a variety of ways, such as returning artifacts and restoring lost knowledge, this can also be done through bison reintroduction. This is already well underway for many tribal organizations throughout the west (Association of Zoos and Aquariums, 2025), yet it isn't as commonly found in the east. Part of this has to due with the lack of Native Americans, and by extension their reservation lands, out east (Baltzersen, 2025). In addition, as previously discussed, many Native Americans in the east lacked substantial spiritual and physical

connections with bison (Belue, 1996). To many of those Eastern Woodlands tribal groups, rematriation by using bison isn't as applicable.

Ghostly Bellows

A family watches the bison herd kept at Kankakee Sands, Indiana, *South Shore CVA, 2021*

The future of the eastern bison is uncertain. No doubt the population of bison will continue to rise, including those raised in conservation herds, as well as the efforts being made to properly reincorporate bison into their former habitats. Maybe one day, we'll see large herds of bison moving freely across the plains of the west, as they once did before. But considering how changed the east is, there might not be enough room for this vision in-between the tens of millions of Americans now living there. Many of the forests and meadowlands the bison once inhabited are damaged, fragmented, or gone entirely. Along with their habitat, the memory of

them even being there has all but vanished. Is their full reintroduction even remotely feasible? Can it even be considered as reintroduction, and not the return of a potentially non-native species?

Whatever path the bison of the east take, we at least now have a glimpse into what was once their world. An eastern United States, where the largest land mammal in the western hemisphere strolled across land that would one day become Indianapolis, Lexington, Birmingham, and Raleigh. If you ever take a stroll through a park out east, try and imagine the scenes that once took place around you. Imagine how they grazed amongst fields of chest-high grass, blazed trails through the woods, and became chased by parties of warriors and pioneers hunting them. If you ever get the opportunity to see a bison in an eastern park, think of how they used to roam unconstrained across the land. Hopefully these visions can help inspire you to show your support for not just bison conservation, but for threatened wildlife across the globe. Both those that have faced the levels of devastation that bison endured, and those that haven't yet. While we can never have the opportunity to fully immerse ourselves into the world of the eastern bison – nor can we ever know if it was truly natural or not – we have the opportunity to not make the same mistake of destroying the worlds of other wonderful creatures that call this planet home.

References

Adair, J. (1930). *Adair's History of the American Indians* (S. C. Williams, Ed.). Kingsport Press. https://readingroo.ms/6/7/6/9/67699/67699-h/67699-h.htm

Association of Zoos and Aquariums. (2025). *SAFE North American Bison Program Plan 2026-2027*. https://assets.speakcdn.com/assets/2332/sf2025-2027noramerbisonfpp.pdf

Baltzersen , J. (2025, October 6). *Can Bison ever reclaim their historic range east of the Mississippi?*. Sierra Club. https://www.sierraclub.org/sierra/can-bison-ever-reclaim-their-historic-range-east-mississippi

Belue, T. F. (1996). *The Long Hunt: Death of the Buffalo East of the Mississippi*. Stackpole Books.

Coppedge, B. R., & Shaw, J. H. (1997). Effects of horning and rubbing behavior by Bison (bison bison) on woody vegetation in a tallgrass prairie landscape. *American Midland Naturalist*, *138*(1), 189. https://doi.org/10.2307/2426665

Gagnon, P. R. (2009). Fire in floodplain forests in the Southeastern USA: Insights from disturbance ecology of native bamboo. *Wetlands*, *29*(2), 520–526. https://doi.org/10.1672/08-50.1

Georges, J. (2023, October 2). *The History of Buffalo Trace Kentucky Straight Bourbon Whiskey*. Nestor Liquor.

https://www.nestorliquor.com/blogs/news/history-of-buffallo-trace-bourbon?srsltid=AfmBOoqvnF-2pedqKHQoCu6-bPwlEixefXiBoBe4ES1ibJF6jHV_oOmn

Gilbert Roe, F. (1970). *The North American Buffalo: A Critical Study of the Species in its Wild State (2nd edition)*. University of Toronto Press.

Google Earth. (2025a). *Aerial view of Ashport, Tennessee*. Google. https://earth.google.com/web/@35.76757549,-89.79158692,76.17727568a,10094.3518324 7d,35y,0h,0t,0r/data=CgRCAggBQgIIAEoNCP_____wEQAA.

Google Earth. (2025b). *Distance from the headwaters of the Turtle River to the Georgia Coast.* Google. https://earth.google.com/web/search/Turtle+River,+Georgia/@31.26548172,-81.48183145, 9.05916477a,74444.44956573d,35y,-0h,0t,0r/data=CiwiJgokCa9BgldPhT9AERCZrhGDPj 9AGRuOccEzVVTAIeolhkMCglTAQgIIAUICCABKDQj_____8BEAA

Haynes, G. (2012). Elephants (and extinct relatives) as Earth-movers and ecosystem engineers. *Geomorphology*, *157–158*, 99–107. https://doi.org/10.1016/j.geomorph.2011.04.045

Hennepin, L. (1880). *A Description of Louisiana.* (J. G. Shea, Trans.). New York: John Gilmary Shea.

Herrick, F. H. (1926). Thomas Ashe and the authenticity of his travels in America. *The Mississippi Valley Historical Review*, *13*(1), 50. https://doi.org/10.2307/1892561

IUCN. (2021). IUCN Green Status of Species: A global standard for measuring species recovery and assessing conservation impact. Version 2.0. Gland, Switzerland: IUCN. https://doi.org/10.2305/IUCN.CH.2021.02.en

Jakle, J. A. (1968). The American Bison and the Human Occupance of the Ohio Valley. *Proceedings of the American Philosophical Society*, *112*(4), 299–305. https://www.jstor.org/stable/985874

Jung, T., Drummond, R., & Miller, H. (2025). Apparent predation of a bison (*bison bison*) calf by a grizzly bear (*ursus arctos*) in southwestern Yukon. *The Canadian Field-Naturalist*, *138*(4), 291–293. https://doi.org/10.22621/cfn.v138i4.3385

Martin, J. M., Zarestky, J., Briske, D. D., & Barboza, P. S. (2021). Vulnerability assessment of the multi‐sector North American bison *Bison bison* management system to climate change. *People and Nature*, *3*(3), 711–722. https://doi.org/10.1002/pan3.10209

McMillan, B. (2006). Records of Early Bison in Illinois. Records of Early Bison in Illinois, *Illinois State Museum Scientific Papers*, 31. https://www.academia.edu/3538613/Records_of_Early_Bison_in_Illinois

Mueller, N. G., Spengler, R. N., Glenn, A., & Lama, K. (2020). Bison, anthropogenic fire, and the origins of agriculture in eastern North America. *The Anthropocene Review*, *8*(2), 141–158. https://doi.org/10.1177/2053019620961119

Nickell, Z., Varriano, S., Plemmons, E., & Moran, M. D. (2018). Ecosystem engineering by Bison (*Bison bison*) wallowing increases arthropod community heterogeneity in space and Time. *Ecosphere*, *9*(9). https://doi.org/10.1002/ecs2.2436

NPS. (2024). *People and Bison*. National Parks Service. https://www.nps.gov/subjects/bison/people.htm

Ratajczak, Z., Collins, S. L., Blair, J. M., Koerner, S. E., Louthan, A. M., Smith, M. D., Taylor, J. H., & Nippert, J. B. (2022). Reintroducing bison results in long-running and resilient increases in grassland diversity. *Proceedings of the National Academy of Sciences*, *119*(36). https://doi.org/10.1073/pnas.2210433119

Remis, M. J., & Jost Robinson, C. A. (2020). Elephants, hunters, and others: Integrating biological anthropology and Multispecies Ethnography in a conservation zone. *American Anthropologist*, *122*(3), 459–472. https://doi.org/10.1111/aman.13414

Robin, W. K., & Lake, F. K. (2001). The role of indigenous burning in land management. *Journal of Forestry, 99*(11), 36. https://www.proquest.com/scholarly-journals/role-indigenous-burning-land-management/docview/220810384/se-2

Rogers, L.R., Ranglack, D.H. & Plumb, G. (2022). *Bison bison* (Green Status assessment). *The IUCN Red List of Threatened Species* 2022: e.T2815A281520252. https://www.iucnredlist.org/species/2815/123789863

Rostlund, E. (1960). The geographic range of the historic bison in the southeast. *Annals of the Association of American Geographers*, *50*(4), 395–407. https://doi.org/10.1111/j.1467-8306.1960.tb00357.x

San Diego Zoo Wildlife Alliance Library Staff. (2024). *Libguides: American bison (bison bison) fact sheet: Physical characteristics*. Physical Characteristics - American Bison

(Bison bison) Fact Sheet - LibGuides at International Environment Library Consortium. https://ielc.libguides.com/sdzg/factsheets/americanbison/characteristics

Sanderson, E. W. (2019). A full and authentic reckoning of species' ranges for conservation: Response to akçakaya et al. 2018. *Conservation Biology*, *33*(5), 1208–1210. https://doi.org/10.1111/cobi.13399

Sanderson, E. W., Redford, K. H., Weber, B., Aune, K., Baldes, D., Berger, J., Carter, D., Curtin, C., Derr, J., Dobrott, S., Fearn, E., Fleener, C., Forrest, S., Gerlach, C., Cormack Gates, C., Gross, J. E., Gogan, P., Grassel, S., Hilty, J. A., Jensen, M., Kunkel, K., Lammers, D., List, R., Minkowski, K., Olson, T., Pague, C., Robertson, P. B., Stephenson, B. (2008). The Ecological Future of the North American bison: Conceiving long‐term, large‐scale conservation of Wildlife. *Conservation Biology*, *22*(2), 252–266. https://doi.org/10.1111/j.1523-1739.2008.00899.x

Sandom, C. J., Ejrnæs, R., Hansen, M. D., & Svenning, J.-C. (2014). High herbivore density associated with vegetation diversity in interglacial ecosystems. *Proceedings of the National Academy of Sciences*, *111*(11), 4162–4167. https://doi.org/10.1073/pnas.1311014111

Somma, L. A. (2019). *American alligator (alligator mississippiensis) - species profile*. USGS Nonindigenous Aquatic Species Database. https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=221

Stewart, M., Peters, C., Ziegler, M. J., Carleton, W. C., Roberts, P., Boivin, N., & Groucutt, H. S. (2025). The state of the late quaternary megafauna extinction debate: A systematic

review and analysis. *Frontiers in Mammal Science*, *4*. https://doi.org/10.3389/fmamm.2025.1678231

Swanton, J. R. (1946). *The Indians of the Southeastern United States*. U.S. Government Printing Office.

Tankersley, K. B. (1987). Bison exploitation by late fort ancient peoples in the central Ohio River Valley. *North American Archaeologist*, *7*(4), 289–303. https://doi.org/10.2190/3c5f-2993-ekr5-9alp

US DOI BWG, Department of the Interior Bison Conservation Initiative 2020 (2020). Retrieved 2025, from https://www.nps.gov/articles/000/upload/BCI2020-2020_05_06_508-Compliant.pdf.

US EPA National Geospatial Support Team. (2025). *Level IV Ecoregions of the Continental United States*. ESRI U.S Federal Datasets. https://hub.arcgis.com/maps/fedmaps::level-iv-ecoregions-of-the-continental-united-states/explore?location=31.158466%2C-81.529222%2C12&path=

White, R. (2018). *The Roots of Dependency: Subsistence, environment, and social change among the Choctaws, Pawnees, and Navajos*. University of Nebraska Press.

Widga, C. (2006). Niche variability in late holocene bison: A perspective from Big Bone Lick, KY. *Journal of Archaeological Science*, *33*(9), 1237–1255. https://doi.org/10.1016/j.jas.2005.12.011

Yeo, S. (2024). *Nature's Ghosts: The world we lost and how to bring it back*. HarperNorth.