History and Taphonomy of Bison Bones From the Des Moines River

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Abstract

Bison were extirpated in Minnesota before the 1850s. A recent discovery of a large number of bison bones in the Des Moines River near Jackson, MN raised questions about how these mammals became locally extinct and about the age and origin of these bones. This project examines the transport history of bones in the river and seeks to determine the extent to which humans butchered or hunted these bison.

To answer those questions, we collected a total of 859 bones, with most of them being bison, from sandbars, banks, and within the shallow portions of the Des Moines River channel. Each bone was identified, catalogued and evaluated for taphonomic alteration, including burial, transport, predator/scavenger markings, and human modification such as cut marks. We assigned a taphonomic grade (1 to 5) to assess the degree of post-mortem alteration, where 1 is unaltered and 5 represents total loss of bone integrity. Bison bones showed evidence of substantial transport in the river, with an average taphonomic grade of 2-3, indicating a substantial degree of transport. Approximately 13% of bison bones showed teeth marks from rodents, and a few showed evidence of modification by larger animals. Approximately 9% show evidence of butchering, mainly cut marks on ribs and long bones.

Research last spring determined that the oldest bones had radiocarbon ages around 1000 BP and the youngest bones being approximately 200 BP, predating European settlement in the area. The degree of rounding and high level of scavenger alteration suggests that these bones were exposed after death and traveled from sandbar to sandbar,
likely since the time of death. Bone taphonomy argues against a longer period of burial followed by short transport time in the Des Moines River, as might occur in a catastrophic flood. Because a substantial number of bones have tool markings indicating human modification, combined with the extraordinary concentration of bison compared to other bone types, we hypothesize that the Des Moines River in this area was a long-lived kill site that predates European bison hunters.
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Introduction

In 2012, a kayaking teen discovered a bison bone in the Des Moines River near Jackson city, MN. She and her mother later found hundreds of bones on sandbars in the river channel. Wanting to know where the bones came from she brought them to Julie Bartley of Gustavus Adolphus College.

Bison were extirpated in Minnesota prior to the 1850s. Native Americans hunted bison as a primary source of food, fur, and bones. When Europeans came over to the Americas, they introduced guns and other hunting methods. Bison then were over hunted to the point where they are not wild anymore (Douglas 2011).

Now that there are bones being found in the Des Moines River near Jackson city, questions are raised about when and how these bison died and how are they transported. By analyzing radiocarbon dates and evidence of bone modifications through analyzing the taphonomy of bones can be used to help reconstruct these processes. Taphonomy is the study of the events that have happened to an organism after death. Main features that will be looked at will be the presence of marks, such as tools from early Native Americans and also bite marks from wither carnivores or scavenging rodents. The presence of these marking will give strong evidence to what may have happened to all of these bison. Taphonomy will also be able to tell us what the environment may have been like around the time of the animal’s death.

There has been a lot of work done looking at bison to look at hunting patterns of early Native Americans. A famous site to look at hunting behavior of early Natives is in the Folsom areas in Oklahoma. Popular sites are the badger hole site (Bement, et. al 2012, and cooper site (Johnson and Bement, 2009). These two articles talked about using taphonomy
to determine how the Folsom people changed their hunting habits as the mammoth and other larger game became more and more scarce. They looked at taphonomy to see the changes in weapon types. Jake bluffs is another site (Carter and Bement, 2010). This too looked at the bison assemblages to look at the change in hunting patterns of early Native Americans.

The goal is to find out how such a large volume of bones, got into the Des Moines River and how they were transported down stream. To do this many more questions need to be answered. Knowing the age of the bison can narrow the possibilities of how the bones may have all ended up in the river. Then by looking at the taphonomy of the bones, the answers to what transported the bones in the river, and how did they get there may become apparent. Through this process we may also determine if there is a possibility if humans played any role in the history of the bison bones.

**Geologic Setting**

The surrounding landscape was heavily influenced by the last glaciation. The Des Moines Lobe stretched from Canada covering the majority of southern Minnesota about 14,000 years ago. The retreat of the glacier causes there to be glacial till in the area. The Des Moines River, which is a tributary of the Mississippi River, is a remnant from the melt of the glacier. The area that was looked at was in the northern area of the Des Moines River near Jackson city, MN. This area had a lot of sand bars that come from alluvium sediment of the glacial till (MN DNR).

The modern river is transporting a lot of sediment, mostly finer to coarse sand but not muddy. There are many examples of undercutting along the riverbanks and some bluffs
along the river. Also the large amount of sandbars shows that there is a high volume of sediment being moved as bed load. This could be due to a dam being removed in Jackson city, a few years ago, causing an increase in the river’s flow.

Map1. Map of the Des Moines River, the arrows points to the general range where the bones that were collected were found (Google maps). The arrows are depicting (from top to bottom) Kilen woods State Park, Jackson City, and St. Petersburg MN.

Methods
Bones were collected from sand bars along the northern end of the Des Moines River, near Jackson City, MN between Kilen woods State Park and Petersburg, MN. Bones were collected from the surface of sandbars and the shallow areas of the channel. Brooke and Kate Rosenberg collected approximately 500 bones in 2012-2013 as they kayaked down the Des Moines River, and were given to us for analysis. Groups from Gustavus collected an additional 350 bones. 12 bones were added to our collection from the Jackson
County Historical Society. These bones were collected by local residence along the Des Moines River. The bones were then cleaned to get rid of any dirt and sediment on the bones so taphonomic data could be clearly observed.

When all the bones are collected and identified they are assigned a sample number and information such as, species, type of bone, and locality was recorded. A thorough observation of each bone was made to locate and identify markings from tools, like saws, bite marks from scavengers and predators, and other features associated with erosion and transport, such as breaking and cracks in the bones. Bone rounding was graded from a scale of 1-5 found on the University College of London’s boneview site (http://www.ucl.ac.uk/archaeology/boneview/). On the boneview site, it has a section describing different degrees of rounding. This system was used as the basis for the degree of rounding scale. All of the observations from the 859 bones were added to a spreadsheet.

Long bones were then selected to be broken up and sent in for carbon dating. Bones were placed in acid for a day, rinsed to neutral and then placed in base over night. They were cleaned again to neutral and went through one final day of soaking in acid. Acid is 1Molar HCl and base is 1M NaOH. The gelatin like remainder was sent to DirectAMS to be dated.

Results

First, describe the bone inventory and insert a table or graph showing the inventory. Then, move on to radiocarbon dating, with a table. Radiocarbon dating of 6 bones gave a range of roughly 200 – 900 years of age that the bison may have come from. Out of the 859 bones collected 211 were identified to be bison. The large majority of the remainder of bones was 363
indeterminate fragments of bones and toes and then there was a mix of other species mostly cows, horses, and deer. Some other bones found were some turkey, fish, and even a wolf bone.

The average taphonomic grade of the bison bones was 2. A trend is seen where the bison have more taphonomic grades of 2 and 3. The other ungulates also averaged around 2. They however tend to have a grade of 1 or 2, with very little bones with a grade of 3 or 4.

Figure 1: A comparison of bison bones to ungulates, looking at their degree of rounding. The left graph includes the bone fragments while the right graph is just the defined bison bones.

Figure 2 shows the percentage of bones that exhibit specific types of taphonomic features. The most common features are cracking at almost 39% of bison bones and then breaking at 19% of bones. 13% of the bison bones show evidence of scavenging by rodents, observed by the existence of small teeth marks and scrapes on the bones (isn’t one of the indicators paired marks?). Roughly 3% of the bison bones show evidence of being scavenged by larger scavengers. These were observed as puncture marks that then follow a long mark originating from the puncture mark. Finally, 9% of the bison bones show
evidence of being butchered. These were seen by the existence of parallel cut marks and other straight cuts and scrapes on the bones surface.

Long bones are separated because these bones should have a higher percentage of cut marks because. These bones have more of the meat that a hunter or predator would be acquiring from the bison; these bones are also marrow bearing, so scavengers might also gnaw these bones in greater proportion.

**Figure 2.** Frequency of particular taphonomic features on bison bones. Each category reports a proportion of total bones that contain that particular marking. Many bones had no markings, and a few had two separate types of markings.

**Figure 3.** Taphonomic features observed in bison long bones (ribs and limbs) .
Discussion

Because of the degree of rounding in the bones, this means that the bison had a moderate amount of transport in the river before they were found (Guéguen, 1994). Almost half the bison bones show cracking and roughly twenty percent of them have broken pieces (Figure 1). This evidence suggest that the bones traveled for a long period of time in the river because of the erosion causes the bones to weaken and begin cracking and breaking.

Figure 3 shows more evidence that the bones went through a lot of transport. The presence of rodent and carnivore scavenger marks suggests that the bones were left in the open and not buried in the flood plains (Klippel, 2007).

About 13% of bison long bones show evidence of tool markings/ human modification. Johnson and Bement’s (2009) found that 30% of bison carcasses had tool marks, in a known butchering site. Our site is somewhat different and we don’t know how many carcasses we are dealing with sense these are individual bones in the river also the bones were transported downriver while the Folsom sites had the carcasses found in situ. This supports that the bison were hunted along the river and that there were possible mass killings.

The long bones are of particular interest because they have a higher chance of showing any human modifications. Knicks of knives would be more relevant on these bones then those on the vertebrate because of the meat the early natives were hunting for. Also sense these bones were larger there of course would be a higher probability of the bone having the modifications. Because of the long transport time, it is possible that the bones had some markings eroded away or became unrecognizable compared to transport damage, like sliding along a rock and receiving a scratch.
Because the fragments do not provide any significant data because of their small size and degree of rounding they are only used for determining the average degree of rounding in the bison bones. The average degree of rounding for non-bison bones is a 2. For bison it is also still a two. This is likely because it may take a longer time to transition from a rounding grade of 2 to 3 then from 1 to 2. Even with the fragments there is still no significant difference between the distributions of the degrees of rounding.

Recently, there was a dam in Jackson city that was recently removed. With the removal of the dam, water flow increased and disrupted a lot of sediment. This event is likely what moved all the bones up river downstream. This is likely why we are finding such a large quantity of bones in the area.

Upriver, the source of the bones still has not been found. We collected bones as far as Kilen Park but we have heard reports of bones being found even more upstream. This will likely be the first step for future work.

Native Americans, prior to European contact, used at least two methods to kill multiple bison simultaneously. In western North America, hunters a group of bison towards the river and caused them to jump off a bluff into the river (Bement, 2010). This kill strategy was used in places like Head-smashed-in and Madison Buffalo Jump. A second strategy, employed by Folsom age, 8000-7000 years, hunters, involved driving bison upstream to a knick point in a river or tributary, where a second group of hunters waited to kill the bison. This latter was employed in Oklahoma, in areas where the topography is similar to that in southwestern Minnesota. Bement et. al (2012) describes this method of hunting as a hallmark hunting technique by Folsom age Native Americans. They would butcher the bison on site because of how large the animals were and leave behind any of
the carcass they didn’t need or couldn’t carry back. No tools or weapon tips were ever found here when bones were collected but this is likely because the sites we collected bones from were most likely far from the actual kill sites sense the bones traveled down the river. It is also likely that these weapon heads were eroded and unnoticeable in the field compared to the other rocks and gravel in the sandbars.

**Conclusion**

Using all the available evidence from these bison bones, we can construct a plausible history. From 900 to 200 years ago, Native American hunters were butchering, and probably killing, bison in the Des Moines River. The parts of the carcasses left behind would have been reduced to bones, and then likely buried in sand bars, where they moved intermittently downstream. The dam built in Jackson likely held the bones and the sediment they were in back until it was removed. This increased the flow of the river transporting more bones and sediments down river.

**References**


