ANALYSIS OF 5ME15338 BISON REMAINS FROM BIG DOMINGUEZ CANYON MESA COUNTY, COLORADO

for the

BUREAU OF LAND MANAGEMENT
GRAND JUNCTION FIELD OFFICE

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Submitted to

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Abstract

In response to a request from the Grand Junction Field Office of the Bureau of Land Management (GJFO BLM), Dominquez Archaeological Research Group examined the osteological remains of a bison recovered from 5ME15338 during a 2014 GJFO BLM construction of a fence. The bones consisted of three pieces of a left femur and two pieces of the left side of the os coxae. One of the specimens exhibited possible but not definitive evidence of cultural modification. Radiocarbon analysis of a bone collagen sample produced a conventional age of 40±30 BP with a calibrated ages of AD1700-1730 (20.5%), AD1810-1850 (18.6%), AD1870-1920 (56.3%).

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1.0 Introduction

In July 11, 2014, Bureau of Land Management (BLM) Grand Junction Field Office (GJFO) archaeologist Alissa Leavitt-Reynolds discovered two disarticulated possible bison bone fragments exposed during construction of fence post hole number 35 at the mouth of Big Dominquez Canyon near its confluence with the Gunnison River in Mesa County, Colorado. In 2017 these were shown to Dominquez Archaeological Research Group (DARG) archaeologist Holly Shelton who noted evidence of possible cultural modification. The bones were transported to the DARG facilities where they were cleaned, stabilized, analyzed, temporarily rearticulated, and photographed. Bone collagen samples were taken and submitted to International Chemical Analysis, Inc. for radiometric testing.

2.0 Location of Faunal Elements

Two possible bison bones were extracted from fence post hole number 35 (Plate 1), constructed by the BLM GJFO in Big Dominquez Canyon in Mesa County, Colorado. The canyon drains northeast into the Gunnison River approximately 20 miles southeast of Grand Junction, Colorado. Situated in semi-desert shrub lands and near a riparian environment (Gregerson 2017), the location is at an elevation of approximately 4740 feet.

Plate 1. Overview of BLM post hole #35 where the bones were recovered.

The bones were located at a depth of approximately 90 to 100 centimeters in inundated fluvial and alluvial deposits of a point bar at the mouth of Big Dominquez Canyon near its confluence with the Gunnison River. It is possible that the animals carcass or the fragments of such were transported downstream in the river channel or the stream channel and then deposited in the sediments of the point bar secondary to decreased velocity of stream flow at an inside meander (Haussner 2014). However, it should not be completely discounted that the remains may have originated from an unknown, but nearby kill site.

3.0 Objectives and Methods

The objective of the assessment was to identify the remains, inspect them for evidence of cultural modification, and if indicated, obtain and submit a bone collagen sample for radiometric testing in order to establish a date of death.

The specimens were identified and analyzed at the DARG facilities in Grand Junction, Colorado by Holly Shelton. The bones were then cleaned using bamboo picks and soft bristle brushes of various width and stiffness. Brush strokes followed the "texture" or "grain" of the bone so as not to degrade or inadvertently mark the bone surface. The bone surfaces were washed with tap water. Tap water in Grand Junction, being slightly alkaline, does not contribute to further bone degradation as would distilled water which absorbs CO_2 from the atmosphere resulting in a slightly acid solution in the pH range most destructive to bone. A spray bottle was then used to dampen the deeper recesses of the bone and the remaining sediment was removed using brushes. A final rinse was done using the spray bottle. The elements were then blotted dry and allowed to completely air dry in a 72° Fahrenheit low humidity environment.

After cleaning each element was visually examined for the presence of cultural modification. Microscopic analysis was performed using an American Optical FORTY binocular microscope. In addition, a variable power 7X - 40X binocular dissecting microscope. An attached Dino-Lite endoscope microscope digital camera was used to create detailed images of selected cultural modification. Professional digital photographic documentation of each specimen, by Masha Conner of Korima Designs, was completed including images of the temporarily reconstructed elements. Each element was scanned using non-destructive ultra-violet fluorescence analysis in order to identify any intentionally applied remnant organic pigments. Faunal element identification was accomplished using techniques set forth by Olsen (1978), Brown and Gustafson (1979), and the University of Wyoming Virtual Bison 3-dimensional Interactive Skeleton website (http://www.uwyo.edu/reallearning/bisonindex.html 2017). A bone collagen sample was taken from the femur as it exhibited the highest probability of evidence of cultural modification. This was submitted to International Chemical Analysis, Inc. of Miami, Florida for radiometric testing.

4.0 Findings

The collected faunal specimens consist of two bovine bone elements, possibly bison, in five separate fragments. These include a partial left femur with a separated trochanter and head of the femur (Plate 2). The medial condyle is missing as is part of the lateral condyle.

Three sets of fine, parallel incised striations are present on the diaphysis of the femur (Plate 3). Digital enhancement using a Dino-Lite endoscopic microscope shows faceted V shaped incisions. This suggests butchering in the form of removal of meat from the bone via the use of a metal tool. A partial left os coxae with a broken pubis (Plate 4) was also recovered from the post hole. This presented with no obvious indication of cultural modification.

Separation of the head of the femur was a natural occurrence secondary to decay of connective tissue while the fracturing of the pubis may have occurred during fence post hole construction. Although the remains were fully disarticulated the elements recovered were in immediate proximity to one another.

Both the femur and os coxae are rated at stage 1 on Behrensmeyer's (1978) weathering scale indicating the bones were buried relatively quickly after the death of the animal and with minimal subsequent disturbance. The weathering of bone situated on surface soils is significantly accelerated by moisture and ultraviolet radiation therefore, the more quickly bone is buried, the less pronounced the deterioration. Stage 1 weathering is suggestive of surface exposure of less than two years; however, it is to be noted that in Behrensmeyer's analysis, most of her specimens (eight of nine) attained stage 2 weathering in two to three years.

Each of the bones has been resting in soils alternating between the vadose zone and the area of full saturation, this being dependant upon bank storage as related to variable stream and river levels over time. Exposure of the bones to iron oxides and calcite has resulted in an overall rich mahogany color with a very thin calcite patina covering approximately five percent of the femur and two percent of the os coxae. This coloration is not necessarily indicative of advanced age but does suggest the bones have been interred for an extended period of time. Root etching is evident on the surface of both bones and four large woody roots were observed – after sample extraction – within the interior shaft of the femur. Had the specimen not been recovered, the continued growth of these roots would likely have resulted in significant deterioration of the specimen within the next year.

5.0 Discussion

5.1 The Occurrence and Fluctuation of Bison in the Desert West

(by James C. Miller and Holly Shelton; abbreviated from Berry et al. 2012)

Plate 2. Collected faunal specimens consist of two bovine bone elements, possibly bison, in five separate fragments. Above are views of the partial left femur with a separated trochanter and head of the femur.

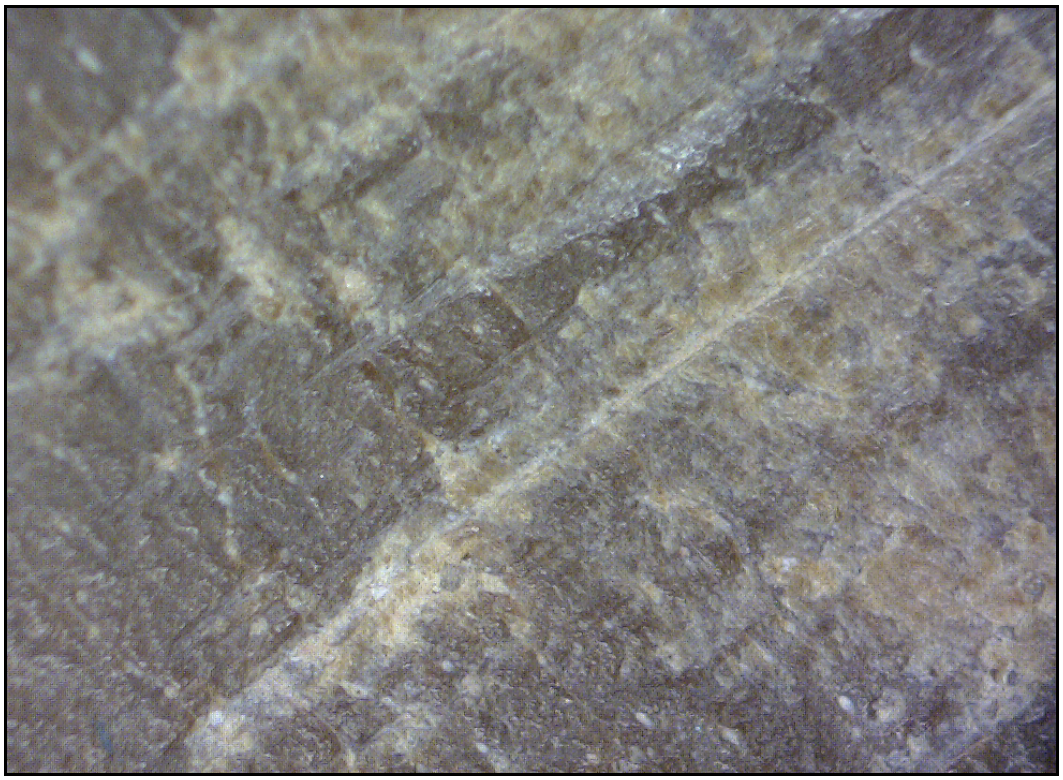

Plate 3. Photo shows three sets of fine, parallel incised striations on the diaphysis of the femur.

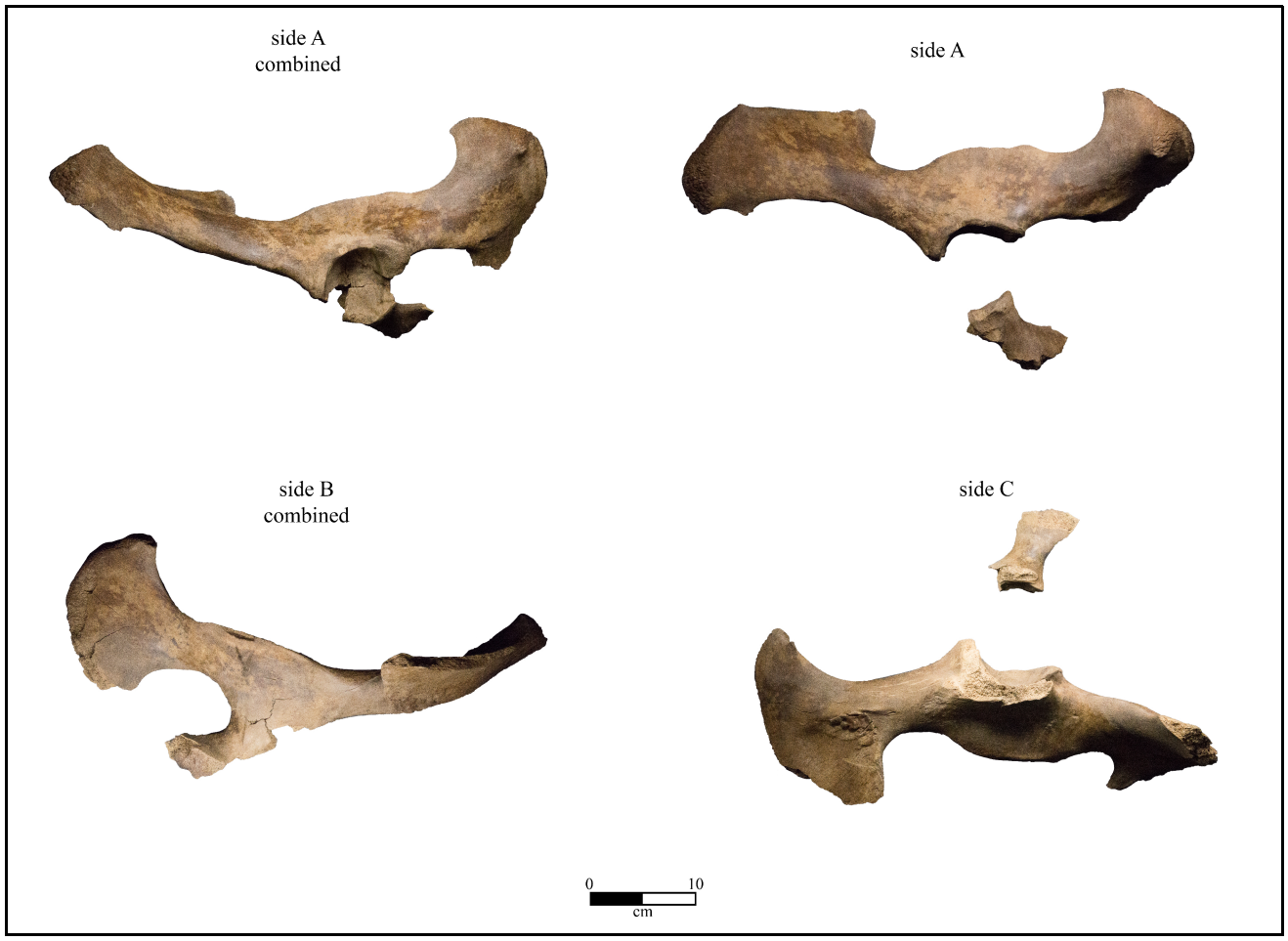

Plate 4. A partial left os coxae with a broken pubis was also recovered from the post hole.

The occurrence of bison on the Great Plains has received substantial documentation with several scholars suggesting bison roamed in abundance west of the Great Plains. Research conducted by Butler (1978), as well as, Meaney and Van Vuren (1993) promotes a basic knowledge of the occurrence of bison west of the Great Plains.

A consensus exists between many scholars and writers that bison were abundant from the Green River in southwestern Wyoming westward through the northeastern corner of Utah and to the Snake River Plain in eastern Idaho (Butler 1978). "According to early travelers (Kingston 1932), there were thousands upon thousands of bison to be seen in the Upper Snake country, but only occasional skulls, 'strays,' and small 'bands' farther west (Butler 1978)." This historical account led Butler to postulate a westward boundary for bison.

Meaney and Van Vuren (1993) undertook an extensive records search to document the former distribution of bison in western Colorado excluding the eastern Colorado plains

due to previous substantial documentation of bison in that area. Their search of records from local museums and private collections yielded 102 specimens from 86 localities in 20 counties. Review of literature yielded an additional 47 localities in 18 counties. Meaney and Van Vuren conclude that bison were abundant in northwestern Colorado. Conversely, bison are presumed to be relatively rare in the southwest portion of the state, particularly the San Juan Mountains and the Uncompahgre Plateau. The rugged terrain of the San Juan Mountains is perhaps one reason for the lack of bison in this area. On the other hand, the Uncompaghre Plateau would have been prime habitat for bison and it is surprising that there are so few reports of bison remains there.

It has been a long held belief that the presence of bison in the Desert West was a phenomenon of the early Historic Period. Recently this belief has been challenged by the inundation of data concerning the presence of bison remains in archaeological contexts. Present data indicates that the presence of bison in the Desert West fluctuated throughout Prehistoric and Historic periods. Archaeological research conducted by Butler (1978), and Lubinski (1995), as well as, Thompson and Pastor (1995) reveal that bison populations were highest during the Late Prehistoric period in the Desert West. The Medithermal climate from 500 BP to 1500 BP fluctuated somewhat but overall consisted of relatively stable cool and wet periods which likely contributed to the high bison populations of that time.

Archaeological investigations by Lubinski (1995) also reveal evidence for a fluctuating bison population. Lubinski dated 93 faunal assemblages from sites in southwest Wyoming ranging from Paleoindian to Protohistoric. Analysis of the faunal assemblages revealed that bison were present in 50% of the assemblages. Bison remains were most prevalent from the Middle Archaic through the Late Prehistoric. From about 5,000 to 8,000 years BP, bison remains essentially disappeared, constituting less than 1% of 955 identifiable species. Bison remains reappear in the archaeological record between 9,000-10,000 BP after a 1000 year hiatus.

Thompson and Pastor (1995) conducted a study similar to Lubinski's. Archaeological data was compiled through an intensive cultural resource management study of southwest Wyoming. Analysis of the data suggests that bison occurred sporadically during the Archaic and increased in frequency during the Late Prehistoric. Frequency was measured through the tabulation of identifiable bison remains in dated components, organized into 400-year increments, spanning the complete cultural chronology from Paleoindian to Late Prehistoric (Thompson and Pastor 1995:79, Table 8). Total frequency of bison remains recorded for sites in southwest Wyoming equals 19, which comprises 11.66% of the combined faunal assemblages. There are no identifiable bison remains in the study area dating to the Paleoindian period. The sporadic occurrence of bison in the Archaic is clearly illustrated by the distribution of only three bison throughout the Early Archaic, one bison in the Middle Archaic and three bison in the Late Archaic. In the Late Prehistoric, there is a marked increase in the frequency of bison. A total of 12 bison were identified at Late Prehistoric sites.

Butler, Lubinski, and Thompson and Pastor acknowledge that there are inherent problems with their data. Assuming that bison remains in archaeological sites correlate directly with bison population deserves careful consideration. It is possible that bison remains in archaeological sites may reflect encounter hunting instead of bison populations. Limited sample size, primarily due to the extremely fragmented nature of faunal assemblages in archaeological sites, plays a significant role in biasing data. Displacement of elements by carnivores and rodents and the inability to discern certain cultural specimens from non-cultural specimens, also causes complications with data interpretation. Native American reliance on bison in the Desert West exhibits a sporadic quality when examined through time. On the other hand, the minimum number of bison manifest in the archaeological record remains relatively constant through time.

The majority of the archeological sites in western Colorado that contain bison remains are typically short-term encampments. Archaeological investigations by Carl E. Conner at sites 5ME5997 and 5ME6144 revealed a small sample of bison bone. A utilized bison scapula was found at site 5ME5997, which is a Late Prehistoric open camp that lies along the rim of Clark Wash in Glade Park, in Mesa County. According to Conner (1998), the carbon date for the hearth feature associated with the bison scapula served as the first substantial date for the presence of bison on the Uncompahgre Plateau. Site 5ME6144, also on the rim of Clark Wash in Glade Park, is a Late Prehistoric rockshelter where four identifiable fragments of bison bone were recovered. Additional bison bones were found in a nearby packrat midden located outside the rockshelter.

Reliable historical documentation of living bison in western Colorado is rare and often anecdotal. Several individuals did document the presence of bison the area including Simmons (2000) who notes that by 1850 bison were no longer found in lower elevations but that the Heap-Beale expedition of 1853 observed Utes hunting bison at Cochetopa Pass and that Mexicans still came to trade with the Utes for “buffalo” hides. In December of 1854, the Utes and Shoshones hunted bison together on the White River (Simmons 2000). Documentation of the last known living bison in western Colorado includes Felger’s (1909) inclusion of Mr. R. S. Ball’s, owner of the Meeker Hotel, observation that the last known bison in the area was killed in 1884 by the Ute Indians at Cedar Springs six miles west of Craig. Dr. W. H. Bergtold, of Denver, stated that in 1894 he found “abundant” bison bones in the area between Rifle Creek and the Bears Ears mountains near Craig.

5.2 Bison on the Uncompahgre Plateau

Butler (1978), and Meaney and Van Vuren (1993) unquestionably confirmed the occurrence of bison west of the Great Plains. Although Meaney and Van Vuren’s record searches of bison distribution in the west provided adequate information to conclude that bison were likely abundant in extreme northwestern Colorado, this assurance was less apparent in the general northwest and west-central regions. As a result of the efforts of the Western Colorado Bison Project (WCBP) (Shelton, Berry, and Conner 2017) it is clear that a

significantly larger population of bison existed in the region than previously indicated. Resultant radiometric data collected by the project supports evidence of ongoing, sustainable bison procurement, and the viability of a relationship between carrying capacity of prehistoric bison populations and aboriginal bison procurement in the study area from late AD 700 through the early 1800s.

However, there is a paucity of evidence of the occurrence of prehistoric or historic bison on the Uncompahgre Plateau. A deteriorated cranial fragment (Shelton, Berry, and Conner 2017) was collected in the 1920s by Bill and Velma Shreeves from the upper Escalante Creek area. The specimen was located on the Shreeves ranch which encompassed the confluence of Escalante Creek and the Gunnison River, Escalante Creek to the Lower Huffington ranch, the XVX ranch on and above the North Fork of the Escalante, and three quarter-sections on the Uncompahgre Plateau (Public Lands Partnership 2014). Presently curated at the Delta County Museum, the specimen exhibits no cultural modification. This specimen is remarkable in that, to date, only two sites on the Uncompahgre Plateau, 5ME5997 and 5ME6144, are known to this researcher to have produced bison bone. It should be mentioned that protein residue analysis testing of rocks from the bottom of Structure 4-A, a storage pit located at 5MN3462, the Jeff Lick Site, produced a result of "probable positive" indicating meat storage from protein sources that included members of Bovidae and Antilocapridae such as bison, bighorn sheep, or pronghorn antelope (Cummings and Milligan 2014:16). Buckles (1971:575-576) recovered bone in buried context during his work on the Uncompahgre uplift; however, the material was lost before analysis was completed, so it is uncertain if bison remains were included in the assemblage. Archaeological investigations at the Taylor site (5LP696), located at the south end of Red Mesa near the Colorado-New Mexico state line, revealed a large artiodactyl rib and vertebra fragments that may represent bison (Firor 2001). A bison skull was also discovered on the Roan Plateau at site 5GF2416 (Tickner et al. 1996). Grand River Institute of Grand Junction, recorded a culturally modified distal portion of a bison left tibia in the upper reaches of Willow Creek in Garfield County. The bone was modified through flaking to produce a fleshing tool.

5.3 Observations

The analysis of the remains recovered from Big Dominquez Canyon are likely, but not positively, indicative of an adolescent bison, *B. bison,* possibly a Mountain bison, of unknown sex, that may have died secondary to human predation. Mountain bison is a sub-species of *B. bison*, known to have been present in western Colorado during at least four distinctive episodes of activity beginning in the Late Prehistoric and forward into the Historic period (Berry et al. 2012).

The femur displays marks that could be interpreted as evidence of cultural modification in the form of three sets of thin, parallel abrasion striations and shallow grooves situated along the diaphysis. Possible evidence of chopping is noted immediately

below the head of the femur and at the distal end but this cannot be confirmed. Rodent gnaw is also apparent on these areas. As the specimen was recovered in alluvial soils near the mouth of a secondary drainage, it is certainly possible that the bones, and therefore the kill site, were originally located upstream in Big Dominquez Canyon at a higher elevation on the Uncompahgre Plateau. Additional faunal elements may remain undisturbed in the surrounding soils.

The recovered elements, a left femur and the left aspect of the os coxae, are taphonomically an articulated unit that was possibly intentionally mechanically separated from the carcass as part of the prehistoric butchering process (Frison 1991 p. 312). This separation could also have resulted from turbation of the carcass during river or stream flooding events.

5.4 Identification of Remains

Faunal identification of the postcranial elements was undertaken using Brown and Gustafson (1979). In addition, the University of Wyoming (2017) Virtual Bison A 3-Dimensional Interactive Bison Skeleton was used as a bison faunal element comparative resource. There are no diagnostic elements to absolutely confirm the bones as bison. However, the robust elements, extreme similarity to faunal identification reference materials, the richness of the iron oxide patina, the depth of burial, and the presence of likely butchering marks all contribute strongly to the possibility that the remains are bison.

5.5 Cultural Modification

Three abrasion striations and groove fields are present on the diaphysis of the femur. Micro-striations are also present. Each of the fields consists of multiple thin, shallow, parallel and a few multidirectional striations and grooves situated beneath a thin adhering matrix of calcite. The majority of the striations and grooves are faceted and V shaped indicative of metal tool cutting (Greenfield 2006). Several of the fields are eroded by root etching. This excludes the possibility that the surficial marks were secondary to abrasive action incurred during the excavation process. The marks result from both parallel and oblique abrasive action against a resistive surface, such as a stone tool scraping tool or, more likely, a metal knife. The marks also tend not to directly follow the microtopography of the bone (Buc and Loponte 2007) but veer at a slight angle from such. The marks are indicative of a scraping or fillet style butchering technique, where the meat is separated from the bone usually with the intent of hanging for drying (Binford 1981:98) in preparation for long term storage.

The possibility of the marks being a result of non-human, natural processes or trampling cannot completely be disregarded and must be considered. The grooves and striations are V shaped and grouped in short, non-random, parallel sequences indicative of metal tool (Greenfield 2006) use, or possibly a sharp stone scraper (Binford 1981). The lack

of pitting and embedded sedimentary particles in the striations and grooves contributes to the determination that the marks are less likely to have resulted from trampling (Dominquez-Rodrigo et al. 2010) than from other modification. It is possible the marks are secondary to stream scour resulting from the turbulent movement of the femur across sediment during high velocity flash flooding or river flood-stage episodes. However, in this scenario one would expect to see damaged and rounded peripherals and multiple random, multidirectional striations and grooves of variable size and depth across the entirety of the specimen and this is not evident. In addition it would be expected that the os coxae, having still been articulated with the femur, would have incurred similar damage, which, it has not. That the specimen could have been partially exposed at some point in time with abrasive action affecting only the indicated portions of the femur cannot fully be discounted. Yet in this situation one would expect more numerous and consistent abrasion marks across the entirety of the exposed portion of the diaphysis and this is not apparent.

Evidence of possible chop marks on the femur is questionable and cannot be confirmed. Possibly secondary to primary butchering (Binford 1981:127), bone structure is missing immediately below the head of the femur and at the distal aspect of the specimen. Slight impact indentations are evident on the periphery of the missing structure, but this is minimal and vague. Although Binford (1981) questions the frequent use of chopping as a primary butchering technique, Frison (1991) frequently describes chopping as an aspect of various strategies used in the processing of a carcass. Though chopping should not be completely disregarded it is much more likely that the damage is a result of carnivore gnawing, (Binford 1981) natural peripheral deterioration, and weathering.

5.6 Radiometric Data

An eight gram bone collagen sample was submitted to International Chemical Analysis, Inc. for radiometric testing (Appendix A). Radiocarbon analysis of a bone collagen sample produced a conventional age of 40±30 BP with a calibrated ages of AD1700-1730 (20.5%), AD1810-1850 (18.6%), AD1870-1920 (56.3%).

6.0 Conclusion

The Big Dominquez Canyon possible bison bone find is significant for several reasons. The bones contribute to recent data that confirms a higher incidence of the occurrence of bison on Colorado's western slope than previously indicated (Shelton et al. 2017). The location of the bones on the east side of the Uncompahgre Plateau is encouraging as their presence provides additional data in support of the theory that bison were present there. It is an ecologically prime bison habitat that would be expected to produce more evidence of bison than has been recovered to date. As well, bison rock art images, located at several sites on the Uncompahgre Plateau, is direct evidence of bison having been present prehistorically.

The radiocarbon date of AD1870-1920 is somewhat unlikely considering the depth of burial, the deep red patina on the bone surfaces, and the presence of probable metal tool butchering marks. Although it cannot be absolutely confirmed at this time, the calibrated ages of AD1700-1730 (20.5%) and AD1810-1850 (18.6%) offer a more plausible date of death, and suggest that the animal was likely harvested by protohistoric or historic Ute hunters.

Traditional Ute oral history refers frequently to bison, bison hunts, and the bison's relationship with man, other animals and supernatural beings (Smith 1974). Although there is a respectable amount of information related to Ute hunting practices in western Colorado, very little is documented regarding actual occurrences of Ute bison hunting on Colorado's western slope. Clifford Duncan, Elder of the Northern Ute Tribe, shared many stories of bison. He stated his grandmother had spoken to him of having heard family stories of the bison hunts of her ancestors and of the importance of the animal to tribal members not only as a means of survival but as symbol of strength and endurance. Prior to his passing, Mr. Duncan asked this writer to "learn all you can about the buffalo" and then "come and teach it to the kids – tell them how it was so they'll know. Too much is forgotten, and there aren't too many of us left" (personal communication, Clifford Duncan 2012).

7.0 References Cited

Behrensmeyer, Anna K.
1978 Taphonomic and Ecologic Information from Bone Weathering. *Paleobiology* 4(2):150-162.

Berry, Michael S., Carl Conner, James C. Miller, Courtney Groff, Holly Shelton
2012 Cultural Resources Monitor Report for the Construction for the Meeker to Greasewood and PCP Pipelines in Rio Blanco County, Colorado, for Enterprise Products, Inc. Ms on file, BLM White River Field Office.

Binford, Lewis R.
1981 *Bones: Ancient Men and Modern Myths*. Academic Press, Inc. Orlando.

Brown, Christopher L., and Carl E. Gustafson
1979 A Key to the Postcranial Remains of Cattle/bison, Elk, and Horse. *Reports of Investigations 57*. Laboratory of Anthropology, Washington State University.

Buc, Natacha, and Daniel Loponte
2007 Bone Tool Types and Microwear Patterns: Some Examples from the Pampa Region, South America. *Methods and Interpretations in Worked Bone*. inapl.gov.ar.:143–157.

Buckles, William G.
1971 *Uncompahgre Complex: Historic Ute Archaeology and Prehistoric Archaeology on the Uncompahgre Plateau in West Central Colorado.* Ph.D. dissertation, Department of Anthropology, University of Colorado. University Microfilms, Ann Arbor.

Butler, B. Robert
1978 Bison Hunting in the Desert West Before 1800: the Paleo-ecological Potential and the Archaeological Reality. *In* Leslie B. Davis and Michael Wilson, eds., Bison Procurement and Utilization, a Symposium. *Plains Anthropologist*, Memoir 14.

Conner, Carl E.
1998 Archaeological Investigations at Site 5ME5997 and 5ME6144: Evaluative Test Excavations as part of the Griffith Land Exchange in Mesa County, Colorado. Prepared by Grand River Institute. Ms on file, BLM Grand Junction Field Office

Cummings, Linda Scott and Jennifer L.B. Milligan
2014 Pollen and Protein Residue analysis of groundstone and sediment samples from the Jeff Lick Stone Circles (5MN3462), West Central Colorado. Ms on file, Dominquez Archaeological Research Group, Inc., Grand Junction.

Dominguez-Rodrigo, Manuel, Palmyra Saladié, Isabel Cáceres, Rosa Huguet, José Yravedra, Antonio Rodriguez-Hidalgo, Patricia Martín, Antonio Pineda, Juan Marín, Clara Gené, Julia Aramendia, Lucia Cobo-Sánchez
2017 Use and Abuse of Cut Mark Analyses: The Rorschach Effect. *Journal of Archaeological Science*, 86 (October):14-23.

Duncan, Clifford
2012 Personal Communication

Felger, A.H.
1909 Birds and Mammals of Northwestern Colorado. *In* Frances Ramaley (ed.), Scientific Expedition to Northwestern Colorado. *University of Colorado Studies* VII(2).

Firor, James
2001 The Myron Taylor Site (5LP696). *In* Chapter 29, Volume 4, Alan D. Reed (compiler), *The TransColorado Natural Gas Pipeline Archaeological Data Recovery Project, Western Colorado and Northwestern New Mexico.* Prepared by Alpine Archaeological Consultants. Ms on file, BLM Grand Junction Field Office.

Frison, George C.
1991 *Prehistoric Hunters of the High Plains* (2nd ed.). Academic Press, San Diego.

Greenfield, Haskell J.
2006 Slicing Cut Marks on Animal Bones: Diagnostics for Identifying Stone Tool Type and Raw Material. *Journal of Field Archaeology*, 31(2):147-163.

Gregersen, Sean
2017 Colorado Life Zones: Seasons, Plants, and Animals. http://shelledy.mesa.k12.co.us/staff/computerlab/ColoradoLifeZonesInformation.htm Accessed 10 September 2017.

Haussner, Elizabeth
2014 5ME15338, 1014-99-Monitoring at Big Dominquez Fence Post Hole 35: Sediment Profile Write-up.

Hill, Andrew
1979 Disarticulation and Scattering of Mammal Skeletons. *Paleobiology* 5(3):261-274.

Kingston, C. S.
1932 Buffalo in the Pacific Northwest. *Washington Historic Quarterly,* 23:163-172.

Lubinski, Patrick M.
1995 *Of Bison and Lesser Mammals: Prehistoric Hunting Patterns in the Wyoming Basin.* Abstract with program, 53rd Annual Plains Conference, Laramie.

Meaney, Carron A., and Dirk Van Vuren
1993 Recent Distribution of Bison in Colorado West of the Great Plains. *Proceedings of the Denver Museum of Natural History* 3(4):1-10.

Olsen, Stanley J.
1974 Post-Cranial Skeletal Characters of Bison and Bos. *Papers of the Peabody Museum of Archaeology and Ethnology*. Harvard University XXXV(4). Kraus Reprint Co., Millwood.

Public Lands Partnership
2014 *A Story of People* and *Landscapes in Transition: The Uncompahgre Plateau 1880 to the Present.* Public Lands Partnership for the Forest Plan Revision of the Grand Mesa, Uncompahgre and Gunnison National Forests. Montrose.

Shelton, Holly, Michael Berry, and Carl E. Conner
2017 *Occurrence of Culturally Modified Bison Bone Elements in Northwest and West-Central Colorado: An Archaeological Assessment for the Western Colorado Bison Project*. History Colorado State Historical Fund Grant No. 2016-AS-008. Prepared by Dominquez Archaeological Research Group, Inc. Ms on file, History Colorado.

Simmons, Virginia M.
2000 The Ute Indians of Utah, Colorado and New Mexico. *University Press of Colorado* (5)99.

Smith, Anne M. (Cooke)
1974 Ethnography of the Northern Utes. *Museum of New Mexico Papers in Anthropology No. 17.* Albuquerque.

Thompson, Kevin W., and Jana V. Pastor
1995 People of the Sage: 10,000 years of Occupation in Southwest Wyoming. *Cultural Resource Management Report 67*. Western Wyoming College Archaeological Services, Rock Springs.

Tickner, Paul A., Alan D. Reed, and Jonathon C. Horn
1996 Report of the Cultural Resource Inventory of Naval Oil Shale Reserve Lands, Garfield County, Colorado. Prepared by Alpine Archaeological Consultants. Ms on file, BLM Colorado River Valley Field Office.

University of Wyoming
2017 Virtual Bison A 3-Dimensional, Interactive Bison Skeleton created for the Zooarchaeology Classes at the University of Wyoming. http://www.uwyo.edu/reallearning/bisonindex.html

APPENDIX A: RADIOCARBON ANALYSIS OF A BONE COLLAGEN SAMPLE

International Chemical Analysis Inc.
1951 NW 7th Ave
STE 300
Miami, FL U.S.A 33136

Sample Report

Submitter Name: Carl Conner
Company Name: Dominguez Archaeological Research Group, Inc
Address: P.O Box 3543, Grand Junction, CO 81502

Date Received	September 05, 2017	**Material Type**	Bone
Date Reported	October 09, 2017	**Pre-treatment**	Col-AAA
ICA ID	17B/0911	**Conventional Age**	**40 +/- 30 BP**
Submitter ID	5ME15338	**Calibrated Age**	**Cal 1700 - 1730 AD (20.5%)** **Cal 1810 - 1850 AD (18.6%)** **Cal 1870 - 1920 AD (56.3%)**