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Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4)

Patrick J. Rennie, Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé,
Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

with contributions by
Melvin Beattie, John Byrd, John (Jack) Fisher, Jr., Richard E. Hughes, James Krakker,
Sean McQueen, and Richard Pettersen

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Cover Illustration:
View North of the Cutbank Face at Beginning of the 1951 Excavations

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Volume II
Appendices

Published 2024

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APPENDIX 1

Site Form, National Register Nomination Form, Excavation Permits (1951-1989),
Property Donation Form (Archaeological Conservancy),
2017 Data Recovery Proposal,
University of Montana Artifact Donation Form

SMITHSONIAN INSTITUTION MAC HAFFIE (2)

RIVER BASIN SURVEY

Reservoir None Canyon Ferry Site No. 24JF4 -R4

State Montana County Jefferson

1. Map reference Jefferson County 2. Type of site Yuma-stratified.
3. Cultural affiliation Yuma and unknown.
4 Location One mile east of Montana City.

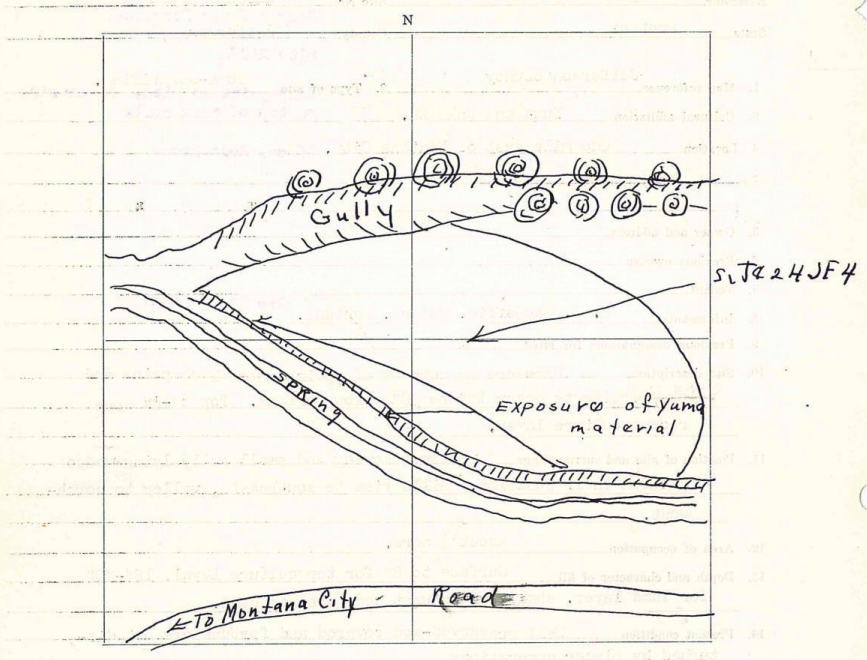
Sec. ? T. ? R. ?

5. Owner and address ?
6. Previous owners ?
7. Tenant ?
8. Informants E. D. MacHaffie, Helena, Montana.
9. Previous designations for site ?
10. Site description Exposure on cutbank of spring where Yuma point and patinated ~~painted~~ artifacts occur 18" to 30" below surface. Top 6"-8" more recent culture layer.
11. Position of site and surroundings Between spring and small gully lying in wedge between their junction. Hills rise to southeast, valley to northwest.
12. Area of occupation About ¼ acre.
13. Depth and character of fill Surface to 8" for top culture level, 18"-30" for Yuma layer, shallow near west end, deep to east.
14. Present condition Well preserved-sod covered and fortunately not disturbed by placer opperations.
15. Previous excavations None.
16. Material collected Yuma point, scraper, blade fragment, flake knife, patinated ~~painted~~ flakes and spalls.
17. Material observed Flakes and spalls.
18. Material reported and owner One point, and one blade with channel flake removed.
19. Recommendations for further work Shallow nature and quantity of Yuma artifacts capped with later site should make this site a very important one.
20. Photograph Nos. Yes.
21. Maps of site See reverse.

Recorded by Bliss, Hughes and Shippee Date Aug. 24, 1947

State Montana County Jefferson Reservoir Canyon Ferry Site No. 24JF4

Site No. 24JF4 -R5 Mapped by _____ Date Aug. 24, 1947



Scale 1" = 301

When entire square represents a section, 1" = 1000'

22. Approach to site: Road south of Helena to Montana City-thence one mile east on dirt road.

23. Remarks:

rb

SMITHSONIAN INSTITUTION

RIVER BASIN SURVEY

Reservoir Canyon Ferry Site No. 24 JF4 R3

State Montana County Jefferson

1. Map reference 2. Type of site Yuma

3. Cultural affiliation

4. Location Outside reservoir area. 1 mile E. of Montana City.

Sec. T. R.

5. Owner and address

6. Previous owners

7. Tenant

8. Informants E.D. MacHattie, Helena, Mont.

9. Previous designations for site

10. Site description Stratified site. Yuma level 18-30 inches below surface. Prolific

11. Position of site and surroundings Exposed along cut bank.

12. Area of occupation

13. Depth and character of fill

14. Present condition

15. Previous excavations

16. Material collected Blade fragments, knife, scrapers, point (Yuma), cores.

17. Material observed

18. Material reported and owner

19. Recommendations for further work Examination of site would add considerably to the culture traits of the Yuma complex.

20. Photograph Nos. 24JF4-1 to 14

21. Maps of site

Recorded by Bliss & Hughes Date 1947

Form by R. Cumming, 9/18/50, from Supplementary Report. 50-080-84

State / County / Reservoir / Site No.

(2)

Smithsonian Institution
River Basin Surveys

Site: 24JF4 Reservoir: None

Location: Jefferson Co., Mont. one mi. E of Montana City

Date collected: 8-47 Archeologists: Bliss, Hughes

Symbols

Area	A
Excavation Unit	Xu
Square	Sq
Feature	F
Burial	B
Human	Hu

(2)

24JF4	Lot #	Location	Description	Remarks
1	18	Surface	Blade fragment	Not cataloged, but stored with Nos. 1-38 are two points loaned by E. D. MacHoffie, Helena, Mont., and coming from surface of 24JF4. One point is Yuma-like, one Folsom-like. (POINTS RETURNED BY BLISS)
2	"	"	" "	
3	"	"	Worked stone	
4	"	"	" "	
5	"	"	" "	
6	"	"	" "	
7	"	"	" "	
8	"	"	" "	
9	"	"	" "	
10	"	"	" "	
11	"	"	" "	
12	"	"	" "	
13	"	"	" "	
14	"	"	" "	
15	"	"	" "	
16	"	"	Blade fragment	
17	"	"	Modified flake	
18	"	"	" "	
19	"	"	Worked stone	
20	"	"	" "	
21	"	"	Blade fragment	
22	"	"	Small core	
23	"	"	" "	
24	"	"	" "	
25	"	"	Worked stone	
26	"	"	Large flake	
27	"	"	Obsidian flake	

(continuation)

(2)

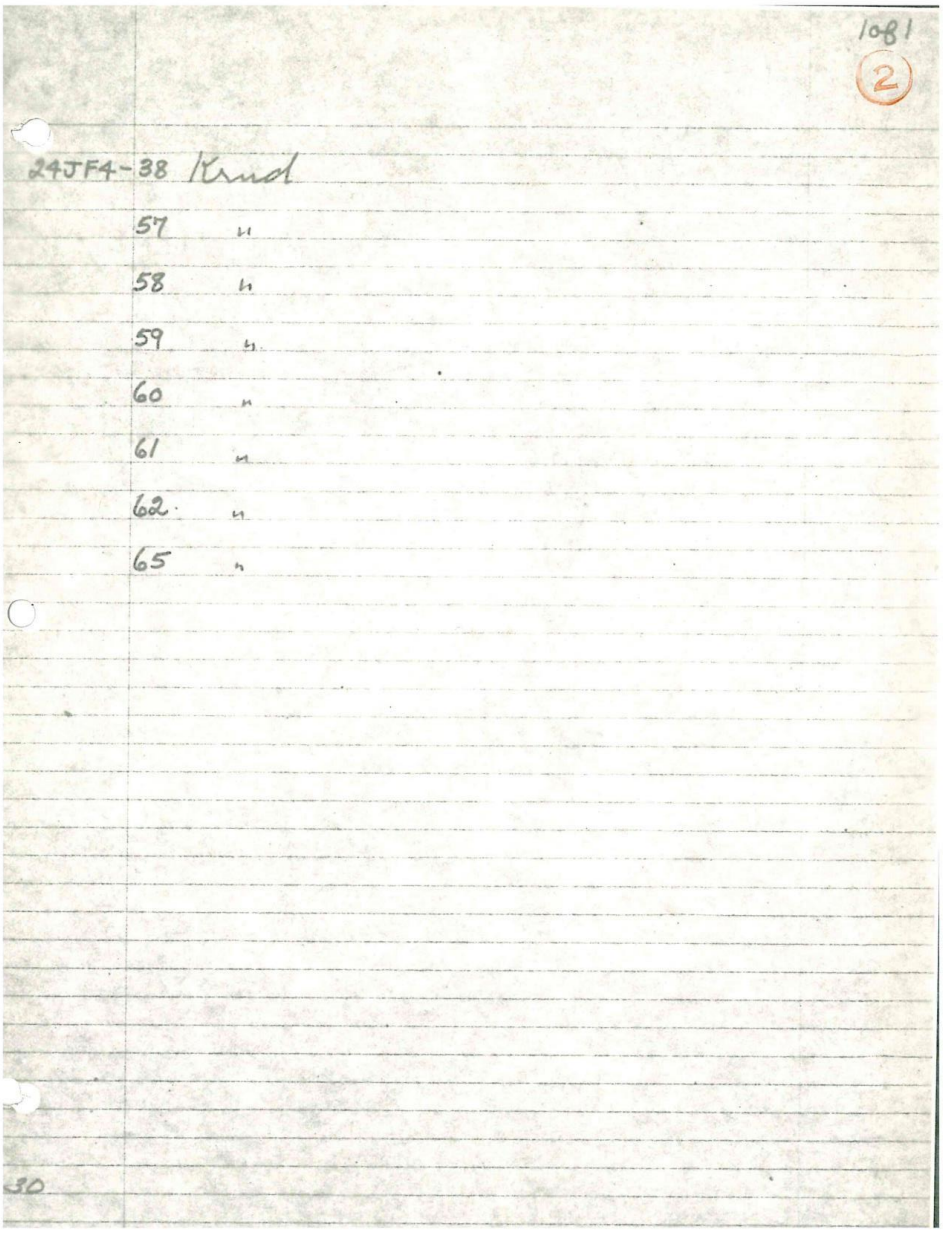
24UPk	Lot #	Location	Description	Remarks
28	18	Surface	Obsidian flake	
29	"	"	Modified? core	
30	"	"	Core	
31	"	"	"	
32	"	"	"	
33	"	"	"	
34	"	"	"	
35	"	"	"	
36	"	"	Anvil stone	
37	"	"	Stone fragments	
38	"	"	Bone fragment	
39	"	Depth 1.3'	Yuma point	
40	"	" "	Blade	
41	"	" "	Scraper	
42	"	" "	Flake	
43	"	" "	Knife	
44	"	" "	Large scraper	
45	"	" "	Stone fragment	
46	"	" "	" "	
47	"	" "	" "	
48	"	" "	" "	
49	"	" "	" "	
50	"	" "	" "	
51	"	" "	" "	
52	"	" "	" "	
53	"	" "	" "	

(2)

(continuation)

2WF4	Lot #	Location	Description	Remarks
54	18	Depth 1.3'	Stone fragment	
55	"	"	Core	
56	"	"	Stone fragments	
57	"	"	Identifiable bone	
58	"	"	Bone fragment	
59	"	"	" "	
60	"	"	" "	
61	"	"	" "	
62	"	"	" "	

24JF4	Lot #	Location	Description	Box #	Remarks
39	18	Depth 1.3'	Yuma point		
40	〃	〃	Blade		
41	〃	〃	Scraper		
42	〃	〃	Flake		
43	〃	〃	Knife		
44	〃	〃	Large scraper		
45	〃	〃	Stone fragment		
46	〃	〃	〃 〃		
47	〃	〃	〃 〃		
48	〃	〃	〃 〃		
49	〃	〃	〃 〃		
50	〃	〃	〃 〃		
51	〃	〃	〃 〃		
52	〃	〃	〃 〃		
53	〃	〃	〃 〃		
54	〃	〃	〃 〃		
55	〃	〃	Core		
56	〃	〃	Stone fragments		
57	〃	〃	Identifiable bone		
58	〃	〃	Bone fragment		
59	〃	〃	〃 〃		
60	〃	〃	〃 〃		
61	〃	〃	〃 〃		
62	〃	〃	〃 〃		
63	—	Surface.	Worked stone		Collected by E. D. MacHaffie, Helena, Mont., & donated by him in May, 1948.
Lot 64		〃	Stone samples		〃 〃
Lot 65		〃	Bone		〃 〃


1081
2
24JF4-38 Krud
57 "
58 "
59 "
60 "
61 "
62 "
65 "
30

AF-9
3/24/50

(2)

Change in Specimen Status

Site No. 24JF4

Cat. No.	Description	Disposition	Date
	Identified, unworked animal bone.	Transferred to the University of Nebraska State Museum.	5-12-52

(2)

nf-9
3/24/50

Change in Specimen Status

Site No. 24JF4

Cat. No.	Description	Disposition	Date
All	All specimens in site.	Transferred to the Division of Archeology, U. S. National Museum.	11-5-54

STATEWIDE ARCHAEOLOGICAL SURVEY MacHaffie

UNIVERSITY OF MONTANA

1. Site No. 24 JF 4 2. Map _____ 3. County Jefferson

4. Twp. 4N Range 3W ; NW ¼ of SE ¼ of Sec. 13

5. Location and Access See published report

6. Contour Elevation _____

7. Description of Site Site is multi-component, Folsom & Plano. See published report. Site records on file, University of Montana Statewide Archaeological Survey, Missoula. Artifacts stored, U of Montana Statewide Archaeological Survey

8. Previous Designations The MacHaffie Site.

9. Published References Forbis, Richard G. & John D Sperry 1952 An Early Man Site in Montana, Amnicum Antiquity, Vol 18, No 2, pp 127-33

10. Owner Mac Haffie 11. Address _____

12. Present Tenant Mac Haffie

13. Area _____ 14. Est. Depth _____

15. Vegetation _____

16. Nearest Water _____

17. Possibility of Destruction _____

18. Artifacts Collected See published report

19. Artifacts Observed _____

20. Type of Map Made of Site _____

21. Foto Numbers B/W See album

22. Recorded By Re-recorded by Floyd W Sharrock 25. Date 8 Dec 70

24JF4

Patricia Robins Flint
June 6, 1975

The McHaffie Site
20 Years After Excavation

An archaeological survey crew from the University of Montana visited the Mchaffie Site in May of 1975. One termed the area a battlefield, one just a cattlefield. It was difficult to find the site but once there we noted extensive chipping debris of chert. There was evidence, near the bend of the stream, of some pot hunter work with a screen.

IN UPPER LEFT CORNER student discovers screening debris at the McHaffie Site

RECENT COW GRAZING, ancient site below.

MONTANA CULTURAL RESOURCES INFORMATION SYSTEM (CRIS) FORM

1. IDENTIFICATION

*required to receive Smithsonian number

1.1 Smithsonian Number: 24JF0004_2022 update **1.2 Field Designation:** MacHaffie Site

1.3 Project Name: MacHaffie Site Comprehensive Study

1.4 University of Montana Anthropology Collections Accession Number: 2010.09.33

2. LOCATION

***2.1 Township:** 9N **Range:** 3W **Section:** 13 **¼ Section(s):** NESENESE1/4 ***2.2 County:** Jefferson

***2.3 UTM Coordinates:** Zone 12; 429,403 m E; 5,153,845 m N ***Datum used:** NAD83 conus

***2.4 Administrative/Surface Ownership:** Private (Archaeological Conservancy)

***2.5 7.5' USGS Maps Names, Dates:** East Helena, MT (1985 provisional edition)

2.6 Narrative of Access: From the intersection of Highway 518 and the McClellan Creek Road, follow McClellan Creek Road 1.05 miles southeasterly to the Sawmill Road intersection. Follow the Sawmill Road 0.25 miles easterly then walk 70 m north to the site locality.

2.7 City/Town: Montana City **Vicinity of:**

3. DESCRIPTION

***3.1 Site Category** (choose one): ☒ Prehistoric ☒ Historic ☐ Paleontological ☐ Combination ☐ Other

***3.2 Site Type** (see recommended site type list, choose all that apply): Lithic Scatter/Buried Components

3.3 Narrative Description of Site: The MacHaffie site (24JF4) in southwestern Montana is not, for the most part, a campsite. It is also not a bison killsite, or a deer hunting site. These associations are incorrectly made in the archaeological literature. It is best characterized as a brief stopping point between residential base and local chert quarries. Beginning with Folsom groups and extending into either the latter portion of the Middle Precontact or possibly even the Late Precontact, Native American occupants generally conducted the same kinds of activities while at MacHaffie. Those typically being translocation of desired tool quality stone from nearby chert sources and further reducing those cores and spalls into flake and bifacial blanks. Subsequently, the desired mid-reduction stage pieces were then transported elsewhere for later use or further refinement. Some removal and rehafting of projectile points, as well as formal tool pressure flaking also occurred. So did limited domestic enterprises. These latter activities, however, appear to have been superfluous to the secondary refinement of flake blanks, flake production from unprepared cores, and percussion refinement of bifacial pieces.

In addition to the repeated use by past Native American occupants of the region, the MacHaffie site also provides one of the few examples, in a Montana archaeological context, of what is probably an early 20th century cultural feature associated with protective magic. Presumably, the phenomenon was created by a local homesteader of European decent.

A detailed technical report prepared in 2022 is the most comprehensive study to date on the MacHaffie site. The reader is directed to this manuscript:

Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

After Smithsonian number received, submit completed form to the Archaeological Records Office.

3.4 Site Dimensions: The site is contained within an area that measures approximately 35 m N/S x 75 m E/W.
Surface visibility: 20%

3.5 Feature Descriptions: See:
Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

3.6 Artifacts: (✔ all that apply) ☒Chipped Stone ☐Wood ☒Ground Stone ☒Ceramics ☒Bone ☐Trade ☒Other
Description: See:
Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

3.7 Diagnostic Artifacts: See:
Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

3.8 Subsurface Testing: See:
Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

3.9 Site function/interpretation: A brief stopping point between residential base and local chert quarries used by past Native American occupants of the region. Occupied intermittently and infrequently by Folsom, Cody, and a variety of archaeological cultures of the Middle and probably Late Precontact Periods.

4. PERIOD

Smithsonian Number: 24JF0004_2022 update

4.1 Apparent Time Period of Site (use dropdowns):
Prehistoric Prehistoric More Than One Period **Historic** Historic More Than One Decade

5. ENVIRONMENTAL SETTING

5.1 Geographic Setting: The MacHaffie site is situated in a minor ephemeral drainage along the northwest foothills of the Elkhorn Mountains in southwest Montana. For a detailed description of the environmental setting, geology, and geomorphology see:

Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser

2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

After Smithsonian number received, submit completed form to the Archaeological Records Office.

MONTANA CULTURAL RESOURCES INFORMATION SYSTEM (CRIS) FORM

5.2 Contour: ☒ Known ☐ Approximate ☐ Unknown **5.3 Elevation:** 4,199 ft ASL

5.4 View/Aspect (estimated direction and distance): The view from the site is restricted in all directions.

5.5 Sediments: Alluvium and colluvium.

Deposition: ☐ Surface Only ☐ Buried Only ☒ Surface and Buried ☐ Redeposited ☐ Unknown

5.6 Available Water Sources (use dropdown)**:** Spring

5.7 Major River Drainage (name, distance, elevation): Missouri River, 17 km NE, 3,659 ft ASL

5.8 Minor Drainage (name, distance, elevation): Prickly Pear Creek, 0.75 km NW, 4,030 ft ASL

5.9 Local Vegetation: The dominant native flora is riparian vegetation, juniper, Douglas fir, ponderosa pine, xeric grasses, sage brush, and prickly pear cactus.

Regional Vegetation: The dominant native flora is juniper, Douglas fir, ponderosa pine, xeric grasses, sage brush, and prickly pear cactus.

6. ASSESSMENT, RECORDING & MANAGEMENT

Smithsonian Number: 24JF0004_2022 update

6.1 Significance: The site was listed in the National Register of Historic Places on April 3, 1986.

6.2 Condition/Integrity: The site was listed in the National Register of Historic Places on April 3, 1986.

6.3 Possible impacts to site: None presently identified. The site has largely been excavated.

6.4 Evaluation: Does this property meet National Register criteria for eligibility?
☒ **Yes** ☐ **No** ☐ **Unevaluated**

Evaluation Procedures/Justification: The site was listed in the National Register of Historic Places on April 3, 1986.

6.5 Recording status: ☒ surface examination ☒ photo ☒ map ☒ subsurface tested

6.6 Recommendations:

6.7 Site Located by: A.J. Harstad and Edmund MacHaffie **Date Located:** 1946?

6.8 Site Recorded by: Wesley L. Bliss, Jack T. Hughes, and J. Mett Shippe **Date Recorded:** August 24, 1947

6.9 Site form update and revisions by: Patrick Rennie **Date updated:** June 8, 2022

6.10 Federal/State Permit No:

6.11 References Cited:

Rennie, Patrick J., Edwin Mohler, John P. Albanese, Jr., Cynthia Riley Augé, Linda Scott-Cummings, Leslie B. Davis, James K. Feathers, and T. Weber Greiser
2022 Revisiting the Ancients: A Natural and Cultural History of the MacHaffie Archaeological Site (24JF4). Independent research report/technical report. Manuscript on file at the Montana State Historic Preservation Office, Helena, MT.

6.12 Artifact Repository: University of Montana Anthropology Collections Accession Number: 2010.09.33

6.13 Field notes/maps/photos repository: University of Montana Anthropology Collections Accession Number: 2010.09.33

6.14 Photographs: University of Montana Anthropology Collections Accession Number: 2010.09.33

***6.15 Map:** See topo map below for locational information.

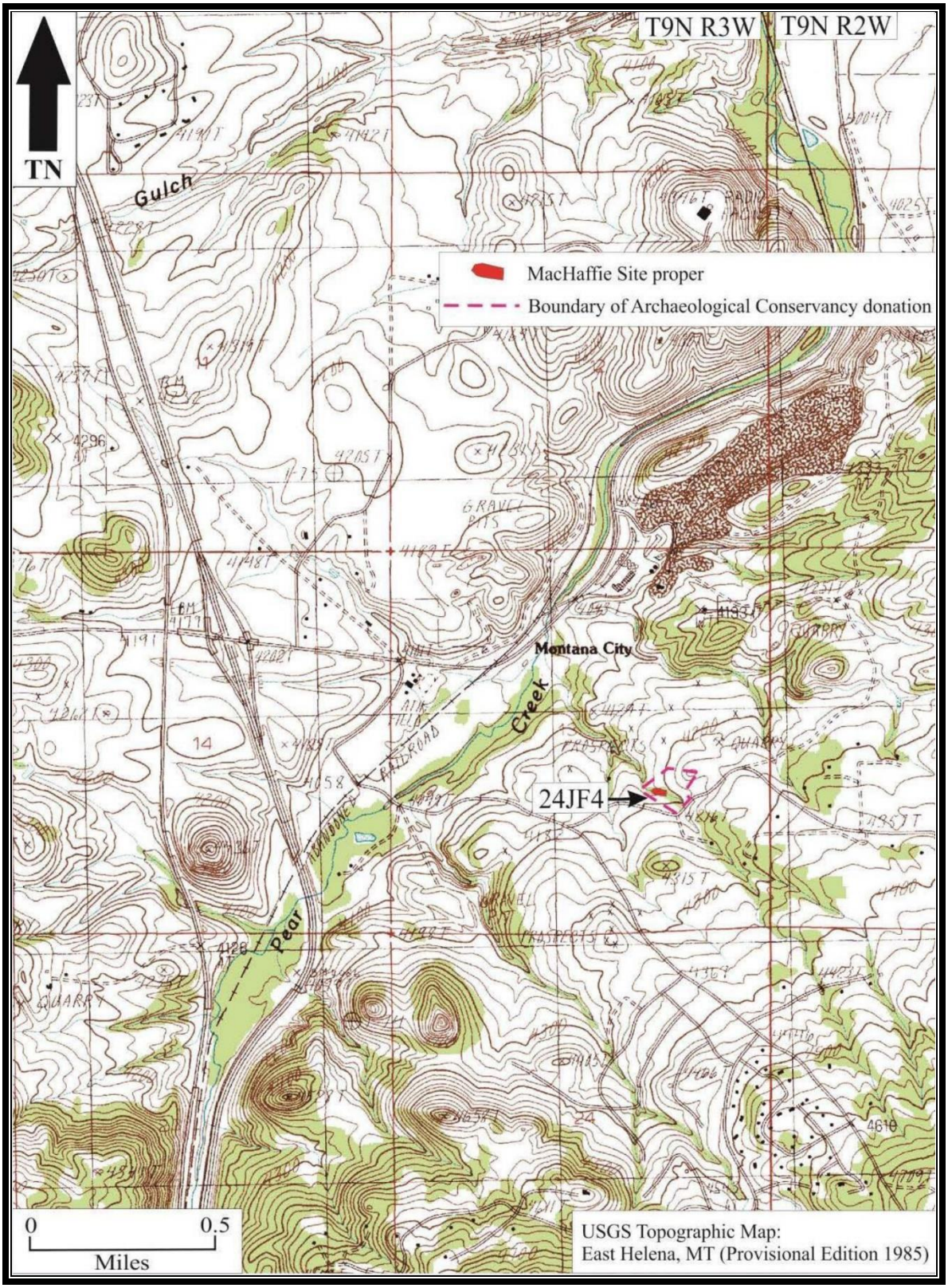
After Smithsonian number received, submit completed form to the Archaeological Records Office.

MONTANA CULTURAL RESOURCES INFORMATION SYSTEM (CRIS) FORM

View Southeast at the MacHaffie site setting (arrow) in 1989.

View Northwest at the MacHaffie site September 2018.

After Smithsonian number received, submit completed form to the Archaeological Records Office.



Topographic map showing the location of the MacHaffie site (24JF4).

NPS Form 10-900

OMB No. 1024-0018
Expires 10-31-87

United States Department of the Interior
National Park Service

National Register of Historic Places Inventory—Nomination Form

For NPS use only

received

date entered

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic MacHaffie Site (24JF4)

and or common N/A

2. Location

street & number 3/4 mile east of Montana City ___ not for publication

city, town Montana City X vicinity of

state Montana code 030 county Jefferson code 043

3. Classification

Category	Ownership	Status	Present Use	
___ district	___ public	___ occupied	___ agriculture	___ museum
___ building(s)	X private	X unoccupied	___ commercial	___ park
X structure	___ both	___ work in progress	___ educational	___ private residence
X site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	X yes: restricted	___ government	___ scientific
	___ being considered	___ yes: unrestricted	___ industrial	___ transportation
	N/A	___ no	___ military	X other: grazing

4. Owner of Property

name Pamela Bompart

street & number General Delivery

city, town Jefferson City N/A vicinity of state Montana

5. Location of Legal Description

courthouse, registry of deeds, etc. Jefferson County Courthouse

street & number Courthouse Square

city, town Boulder state Montana

6. Representation in Existing Surveys

title N/A has this property been determined eligible? ___ yes X no

date ___ federal ___ state ___ county ___ local

depository for survey records

city, town state

7. Description

Condition		Check one	Check one
___ excellent	___ deteriorated	_X_ unaltered	___ original site
_X_ good	___ ruins	_X_ altered	___ moved date _____
___ fair	___ unexposed		

Describe the present and original (if known) physical appearance

The MacHaffie archaeological site is located along the channel of a small unnamed tributary of Prickly Pear creek adjacent to a permanent spring. The site sits in the foothills of the Elkhorn mountains on the east slope of the Continental Divide approximately eight miles south of Helena in southwestern Montana. Prickly Pear creek enters the Helena valley of the Missouri River approximately 1 mile from the site and drains into the Missouri River about 10 miles from the site location.

The site contains two activity locations, a camp area and a quarry area. The camp area is characterized by a moderate surface scatter of chipped stone debitage and tools extending approximately 200 meters down the small drainage and a distance of 50 meters on either side of a spring and a small creek. Buried bone and stone materials are also found in exposed sidewalls along the channel cut to a maximum depth of over 1 meter. Archaeological investigations in the camp area identified 3 components ranging from the Folsom Period to the Middle Archaic Period.

A prominent Madison limestone outcrop knoll is located approximately 100 meters to the northeast of the spring. This area of the site contains evidence of prehistoric quarrying activity. A widely dispersed scatter of fractured chert flakes and shatter and several quarry pit depressions are visible on the surface near the top and on the slopes of the knoll. The availability of good quality chert at this location, and the clear-cut evidence for prehistoric quarrying activity suggests that aboriginal quarrying was an important factor in prehistoric occupation of the MacHaffie site. Several historic mining prospecting pits are also in this area.

Site History and Excavation

The MacHaffie site was discovered in 1938 by A.J. Harstad, an amateur mineralogist from Helena. The site is named for Mr. Edmund D. MacHaffie, an amateur archaeologist who lived in the Helena area. Harstad pointed out the presence of chipped stone and bones protruding from the cut-bank to MacHaffie who discovered Middle Archaic Period projectile points, and an Early Period fluted point during surface investigation. A later visit to the site by MacHaffie turned up a Scottsbluff projectile point. In 1947, a River Basin Survey crew from the Smithsonian Institution working in the Canyon Ferry area visited the site at the urging of Mr. MacHaffie. Survey crew director Wesley L. Bliss later reported the site and its importance to the professional community (Bliss, 1949, pp.125-126). In 1950, Carling I. Malouf of the University of Montana conducted limited test excavations at the site and demonstrated the multi-component nature of the site (Forbis and Sperry, 1952, p. 127).

During the summer of 1951, more extensive investigation at the MacHaffie site was conducted under sponsorship of Columbia University, the American Museum of Natural History, and Montana State University. Richard Forbis, then doctoral candidate at Columbia University and a graduate assistant to Carling Malouf in earlier investigations, directed the excavations. A six person crew of Columbia University students excavated the MacHaffie site for a period of 3 weeks.

One 400 foot squared block unit and five smaller test units ranging from 25 to 4 square feet were excavated on a terrace remnant which formed a small island between two channels of the creek near the spring. Excavations extended to a depth of over 6 feet. Additional small test units were excavated on the terraces flanking the creek. These small test units showed the presence of cultural materials but not so deeply stratified as in the central portion of the site and only limited investigations occurred in these areas. No subsurface test excavation occurred in the quarry area of the site.

The MacHaffie site was found to contain three prehistoric cultural components. These included a Folsom component (dated approximately 9500 to 10,500 years B.P.), a Scottsbluff component (dated approximately 9,000 to 10,000 years B.P.), and a Middle Archaic Period component (Dated 2,000 to 1,000 years B.P.) called the Helena component by the site excavators. Each of the three components are stratigraphically distinct and separated by culturally sterile soils. Cultural materials recovered from the MacHaffie site include stone and bone tools; flaking debitage; assorted faunal remains including bison, deer, wolf, rabbit and ground squirrel; and a hearth feature. Bison remains recovered from the Folsom component are clearly larger than the modern form, but due to the absence of diagnostic features, could not be assigned a species designation.

A single uncorrected radiocarbon date of 8100 ± 300 years before present was obtained on charcoal from the Scottsbluff component at the MacHaffie site.

The MacHaffie site functioned as a campsite for prehistoric hunters over a period of some 9,000 years. The availability of good quality raw material on the site and the evidence of lithic reduction and stone tool manufacture in the camp location suggests that the site occupation was associated with quarrying activities.

Present Site Environment

The MacHaffie site is located in the Northern Rocky Mountain physiographic region on the east flank of the Continental Divide. Site elevation is 4200 feet a.s.l. The site lies adjacent to a spring and a small steam channel. The draw which contains the site is located on a tongue-like formation of foothills which projects into the southern edge of the Prickly Pear Valley. This series of foothills make up the northwestern-most extension of the Elkhorn Mountains. To the north and northeast lie the Helena valley and the open grassland environment which predominates there. To the south and southeast are the pine timbered slopes of the Elkhorn Mountains and beyond, the Boulder River which flows to the south and feeds into the Jefferson River. To the west of the site across Prickly Pear Creek lie open grasslands and foothills of the Boulder Mountains and the Continental Divide.

Because the MacHaffie site is located in a transitional zone between the mountainous terrain of the Elkhorn and Boulder Mountain ranges and the open grasslands of the Helena Valley, vegetation in the site vicinity is mixed and varied. The nameless spring fed creek along which the MacHaffie site lies runs year round

and is lined with willow, chokecherry, serviceberry and quaking aspen. Site vegetation includes riparian bottomland species, open prairie shortgrasses and forbs, and scrub pine. Most archaeological excavation at the site has been conducted on the downstream point of a terrace remnant island below which two stream channels merge. The dissected terrace is quite small being approximately 15 meters NS by approximately 25 meters EW. Although the terrace remnant is covered with mixed shortgrasses and forbs, the landform is completely surrounded by aspen and a thick riparian cover.

The general topography in the vicinity of the MacHaffie site is characterized by rolling hills, moderate to steep sided drainages and small bedrock capped knolls which outcrop the lodgepole member of the Madison limestone. These knolls show exposures of chert solution cavities in the limestone which were mined prehistorically. Quarry areas littered with lithic debitage occur on several knobs in the MacHaffie site vicinity.

Soils in the area include the Brownlee stony loam association, the Fairdale loam site association, the Breece cobbly loam association and the lap stony loam association (Denney et al, 1973:A-41). Excavations of the site revealed a soil profile consisting of coarse, vari-colored waterborn sands about five feet in depth overlain by a distinctive fine grained smooth-textured black soil which contained the earliest cultural component, that of the Folsom period. The upper surfaces of this horizon grades into a compact, fine grained gray clay overlain by a soft, smooth- textured, gray soil which averages about one foot in depth. Scottsbluff cultural materials were located in a zone about four inches thick, close to the boundary of the compact fine grained gray clay and the softer gray soil (Forbis and Sperry, 1952). Middle Archaic cultural materials were encountered near the top of the soft gray soil and on the site surface.

Geologically, the Montana City area is on the interface zone between the Miocene age igneous Boulder batholith and various older sedimentary series including the Mississippian age Madison limestones. The intrusion of the igneous rocks occurs in the form of dikes and sheets which have altered the sedimentary rocks in the area and commonly crystalized the latter as a result of heat given off by the once molten material (Knopf, 1913; Pardee and Schrader, 1933). The upper contact between the granite mass and the bedded rocks is uneven, and arms and offshoots of the former rock extend upward. These locations are characterized by outcrop knolls which contain metamorphosed chert cavities within the bent and folded Madison limestones.

Quaternary Environment of the site

The MacHaffie site shows evidence of human occupation dating back as early as about 10,000 year before present. No multidisciplinary paleoenvironmental study has been conducted in the area, so reconstruction of the site's environment at the time of the early period Folsom and Scottsbluff occupations can only be made based on information derived from adjacent areas.

Studies of the history of glaciation in the Boulder and Elkhorn Mountain ranges suggests that a major glacial advance occurred in those areas during the late Pleistocene Pinedale glaciation (Ruppel, 1962; Freeman, Ruppel and Klepper, 1958; Klepper, Weeks and Ruppel, 1958). Glacial melt in these areas following the Pinedale advance was a comparatively rapid process. Paleoenvironmental reconstruction in the area using core samples from bogs suggests that by 12,000 years ago these alpine glaciers began their retreat and a treeless periglacial tundra environment probably occurred in the vicinity of the MacHaffie site (Melton, 1985). The site was probably located at or near alpine glacier margins from about 10 to 12 thousand years ago. Recovery of the fossil snail Vallonia gracilicostata within the Scottsbluff component suggests that by the time of Scottsbluff occupation, the MacHaffie site was somewhat remote from large ice masses since this gastropod does not thrive on or near glaciers (Forbis, Strong and Kirby, n.d.: 148). The faunal assemblage from the Early Period occupation of the MacHaffie site suggests that an open grassland vegetation predominated in the local area during the Folsom and Scottsbluff occupation of the site.

Evidence in the Helena Valley suggests the formation of a lake during the late Pleistocene. Lake Helena may have been an extension of Glacial Lake Great Falls where a large ice blockage on the Missouri River during the Pinedale advance damed the river's flow. Iceblockage of the Missouri River may also have occurred in other locations at different times during the late Pleistocene and early Holocene. Lake Helena probably formed during periods of increased flooding as glacial ice from the late Wisconsin Pinedale glaciation receded. According to some reports, the flooding took place 14 to 15 separate times and the lake reached an estimated maximum level of 4,000 feet elevation (Wetzel, 1983; Lemke, Mudge, Wilcox and Powers, 1975; Colton, Lemke and Lindall, 1961). A correllation of early period occupation at the MacHaffie site with the existence of glacial Lake Helena has never been investigated.

Present Site Condition

Today, the MacHaffie site shows evidence of disturbance from "pothunting" activities. The site has been known to local collectors in the area since the early 1950's and has suffered from unauthorized excavation and surface collecting since that time. In the small terrace remnant area where previous scientific excavation occurred, the present surface of the sites exhibits a series of depressions and grass covered mounds from vandal pits and back dirt piles. Most of the upper component in the site area have been impacted by this activity, however the more deeply buried Folsom and Scottsbluff components at the site still remain relatively undisturbed.

8. Significance

Period	Areas of Significance—Check and justify below			
X prehistoric	X archeology-prehistoric	community planning	landscape architecture	religion
1400–1499	archeology-historic	conservation	law	science
1500–1599	agriculture	economics	literature	sculpture
1600–1699	architecture	education	military	social/ humanitarian
1700–1799	art	engineering	music	theater
1800–1899	commerce	exploration/settlement	philosophy	transportation
1900–	communications	industry	politics/government	other (specify)
		invention		

Specific dates **Builder/Architect**

Statement of Significance (in one paragraph)

The MacHaffie archaeological site is significant because it contains important information about cultural change in the Northwestern Plains area over a period of some 9,000 years. Rare data concerning cultural adaptation during the little known Paleo-Indian period is also present on the site and this information could increase our understanding of human adaptation during the late Pleistocene and early Holocene periods. The MacHaffie site is significant on a statewide basis because at the time of discovery, it was the first archaeological site to prove man's presence in Montana during the late Pleistocene and early Holocene period. The clearly stratified sequence of cultural deposits represents one of the longest time spans of human occupation for any site in Montana.

The MacHaffie site is also significant on a regional and national level. It was the first Folsom site found on the Northwest Plains and expanded the known geographic distribution of Folsom peoples much further to the north than had previously been know. All Folsom sites known prior to the discovery of the MacHaffie site were in or near the Southwestern United States. The MacHaffie site is also one of the few sites in North America which exhibits Folsom component materials in a clearly stratified context and contributed to our understanding of the chronological relationship of Early Period cultural manifestations in North America. At the time of excavation the temporal relationship of the early period Scottsbluff and Folsom components was unclear. The MacHaffie site demonstrated that Folsom predates Scottsbluff.

Although the MacHaffie site has been impacted by collection and digging, only a small portion of the uppermost Middle Archaic component of the site has been heavily impacted. Due to their depth, Early Period cultural materials remain relatively intact with the Scottsbluff and Folsom components retaining their prehistoric integrity. In addition, most vandalism has been isolated to a small area thereby preserving important information in other portions of the site. The potential for the reconstructing past lifeways and environment during 9,000 years of prehistory remains high at the MacHaffie site.

9. Major Bibliographical References

See Continuation Sheet

10. Geographical Data

Acreage of nominated property 3 acres

Quadrangle name East Helena, MT Quadrangle scale 1:62500

UTM References

	Zone	Easting	Northing
A	12	429400	5151536510
B	12	429640	5151538215
C	12	429640	5151536610
D	12	429300	5151535610
E			
F			
G			
H			

Verbal boundary description and justification

See Continuation Sheet

List all states and counties for properties overlapping state or county boundaries

state N/A	code	county	code
state	code	county	code

11. Form Prepared By

name/title Dave Schwab, Archaeologist, Anthropologist

organization Montana SHPO date January 3, 1986

street & number 225 N. Roberts telephone (404)444-7715

city or town Helena state Montana

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

X national ___ state ___ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature Marcella Sherfy

title SHPO date 2-14-86

For NPS use only

I hereby certify that this property is included in the National Register

date

Keeper of the National Register

Attest: date

Chief of Registration

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Site Boundary

The MacHaffie site encompasses an area of approximately 3 acres. Starting from point A (see accompanying map), the Southeast boundary of the site runs for a distance of approximately 468 meters along the north roadcut of the Sawmill gulch county road to point B which is marked by a corner fencepost marker. From point B, the site boundary runs due north along a fenceline a distance of approximately 150 meters to point C. Point C is marked by a sizeable depression which occurs along the fenceline. From point C, the boundary runs at 249 degrees of true north a distance of about 380 meters along the base of the outcrop knoll and across the creek bottom to point D at the base of a fenceline which runs along the driveway on the Bompart property. Point D is marked by a fencepost which is located next to a watering trough. Finally, the southwest boundary of the site runs along a fenceline which flanks the northeast side of the driveway for a distance of approximately 110 meters at 136 degrees of true north to point A.

Boundary Justification

The boundaries of the MacHaffie site were established on the basis of three sources of information; review of site records and excavation documentation, personal consultation with site excavators, and visual surface reconnaissance of the site. Because the bulk of previous archaeological investigation at the site focused on a small central area in the drainage where Paleo-Indian materials were located, no clear cut information is available as to the exact extent of subsurface cultural remains on the site. Early reports of an extensive scatter of Late Archaic cultural materials on the surface within the designated boundaries of the site could not be corroborated by recent examination due to extensive collecting of surface artifacts by vandals. However a light scatter of surface artifacts was observed in undisturbed portions of the site. Because the quarrying location of the site was never fully investigated, site boundaries at this location were based on visual surface inspection and may be subject to change with more intensive investigation.

Site boundaries were chosen to reflect a best estimate of the greatest extension of surface artifacts and features using available data sources. For convenience in locating site boundaries on the ground, roadcuts and fencelines were utilized as boundary markers where appropriate. These boundaries are subject to change pending more accurate research designed to identify the maximum extension of cultural materials at the site.

LICENSING AGREEMENT

Licensing agreement, made this Apr 6 1951 between James Bompart licensor, and Columbia University, licensee, represented by _____.

I, James Bompart, licensor, hereby license Columbia University, New York City, N.Y., and its appropriate agencies and personnel, to go on my land, SE quarter, Section 13, township 9 north, range 3 west. for the purpose of exploring and excavating for any possible archaeological remains that may be found thereon, subject to the following conditions:

1. All specimens of archaeological interest found therein, become the property of the University, in the care of the University provided, however, that any treasure so found, such as gold, precious gems, etc., becomes the property of the landowner, subject to a right in the University to request a loan of such treasure for one year, for research purposes, study, etc.

2. The licensee will refill any holes that might lead to the injury of livestock.

3. The licensor may terminate the license at any time, upon a thirty day notice in writing to the licensee or its authorized agent.

The licensee will not divert any springs from their natural channels

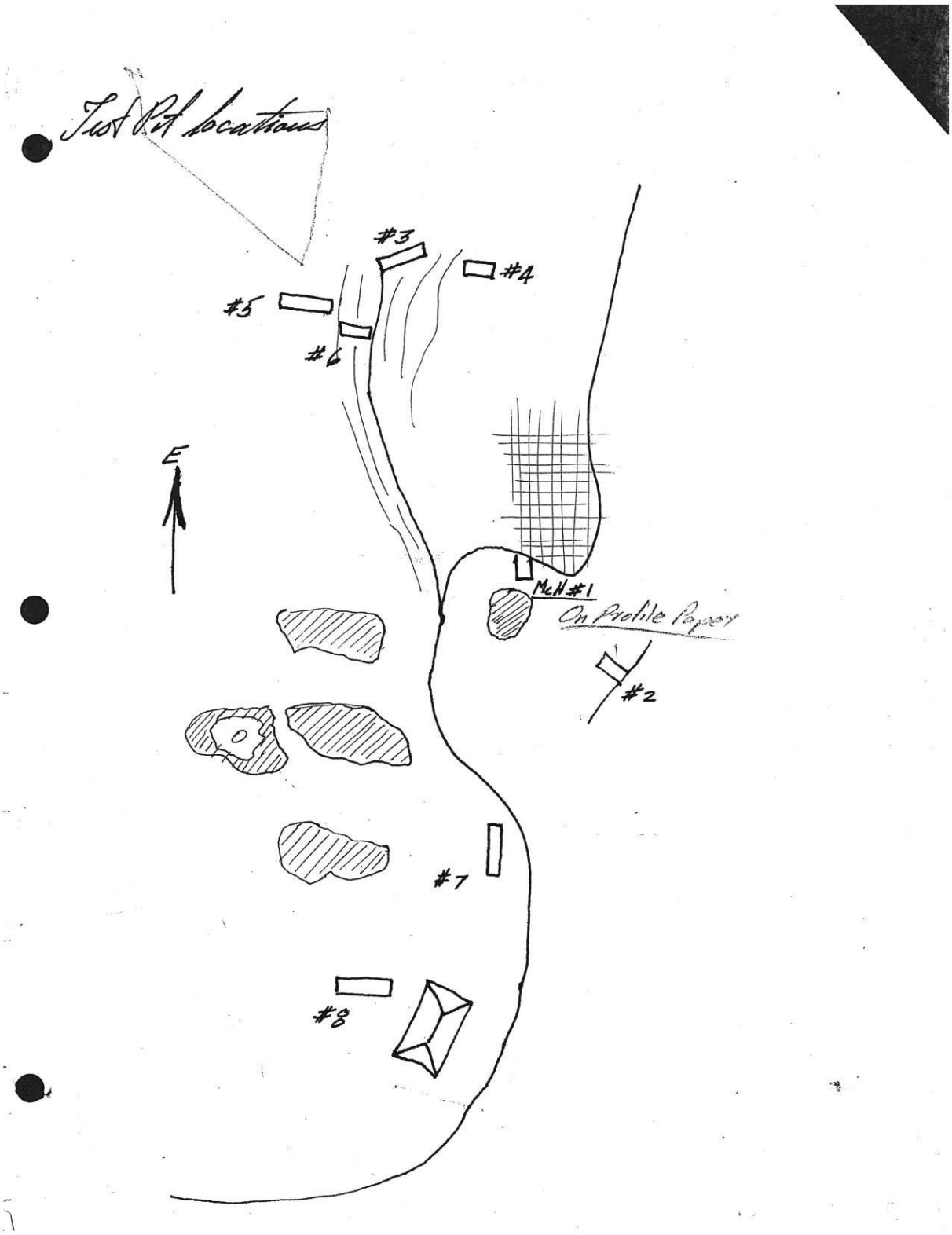
In witness whereof, the licensor herein, sees his hand, the day, and year first written above.

James Bompart
Licensor

Wm. Duncan Strong
Licensee

Wm. Duncan Strong
Dept of Anthropology
Columbia University
New York 27, N.Y.

Carling I. Malouf
Dept of Sociology and Anthropology
Montana State University
Missoula, Montana



Richard G. Forbis' 1951 plan sketch of camp (tent) and excavation units.

PERMIT AGREEMENT

This permit agreement entered into this 20th day of Sept, 1988, by and between Pamela Bompart, Box 6165, Helena, MT 59604, and Montana State University, Bozeman, MT 59717.

WHEREAS Pamela Bompart is the owner of a certain parcel of real estate in Jefferson County, MT (NW1/4 SE1/4 of Section 13, Township 9 North, Range 3 West, P.M.M.) on which is located a site of early prehistoric human occupation of established regional and national significance; and

WHEREAS Montana State University is desirous of scientifically investigating this National Register quality archaeological site to document and develop its highest prehistoric information potential so that Montana State University and interested publics may become informed about and better understand the cultures of early native peoples represented at the MacHaffie Paleoindian Site (24JF4); and

WHEREAS Pamela Bompart is amenable to having the aforementioned site professionally investigated under the direction of Leslie B. Davis, M.S.U. Professor of Anthropology.

NOW THEREFORE, in consideration of the mutual promises hereinafter recited, IT IS AGREED as follows:

1. Pamela Bompart hereby permits Montana State University exclusive investigative access to the site only for the purpose of excavating and

interpreting extant prehistoric cultural remains; of recovering archaeological artifacts and associated animal remains; of collecting cultural charcoal samples for dating; of collecting samples of sediment for soil and pollen analysis; of preparing and describing a geological profile across the drainage; and of studying local geomorphology, all leading to a comprehensive interpretation of man/resource interactions during prehistory;

2. This permit includes the privilege of ingress and egress and shall extend to students and faculty of Montana State University and project consultants who participate in the investigation or are otherwise involved. The site location will not be publicized so as to avoid attracting unauthorized persons who might exploit the site or property destructively. The site owner and her representatives are welcome throughout the investigations;

3. All archaeological remains recovered from the site will be catalogued and studied in appropriate detail for full publication and museum interpretation. After completion of study and at the end of a 2-year period following collection, the archaeological artifacts will be delivered to Pamela Bompart accompanied by a detailed catalogue record;

4. Montana State University assumes all risk of personal injury and damages which might occur in connection with the entry upon and conduct of aforedescribed activities on the property during the life of this permit; and Montana State University hereby waives and releases Pamela Bompart from damages of whatsoever kind or nature which the university

faculty, students and project consultants may suffer or receive on or about the premises which are not the result of actions by Pamela Bompart or her agents and Pamela Bompart waives and releases Montana State University from any and all damages and personal injury which she or her representatives may suffer or receive on or about the premises which are not the result of the negligence of Montana State University;

5. Montana State University agrees that Pamela Bompart and her agents may utilize the permitted premises in any matter that does not interfere with safety or with objectives of this permit agreement as described in 1. above;

6. The term of this agreement shall extend for the period from January 1, 1989 through December 31, 1990, with an option for extension beyond that term. Montana State University will pay to Pamela Bompart the sum of $7000.00 in two equal payments of $3500.00 each on July 1, 1989 and July 1, 1990 in compensation for direct damage to property and persistent citizen trespass and inconvenience to owner thereafter;

7. Montana State University will advise Pamela Bompart of the preliminary results of the investigation promptly following completion of fieldwork and fully following publication of research and writing of technical reports; and

8. Montana State University will backfill all excavated areas and will restore and reclaim them as near to their original surface topography and vegetative cover as possible with measures also taken against the

growth of noxious weeds. Premises liability insurance in amount of one million dollars will be purchased annually during the life of the permit and for a 5-year period following cessation of university investigations on site.

9. This agreement shall inure to the benefit and be binding on the parties, and heirs, executors, administrators, and successors of the parties.

IN WITNESS, the parties have set their hands and seals hereto this 20th day of Sept, 1988.

Owner:

Pamela Bompart

Pamela Bompart

Montana State University

William J. Tietz
President

John W. Jutila, Vice President
for Research

Dorothy L. Bramlow
University Attorney
Review For Form and Content

DONATION AGREEMENT

for the MacHaffie Archaeological Site

in Jefferson County, Montana

AGREEMENT made by and between Ruth Pamela Bompart (hereinafter the "Donor"), and The Archaeological Conservancy, a California non-profit corporation (hereinafter "the Conservancy"), whose offices are at 5301 Central Avenue, NE, Suite 902, Albuquerque, New Mexico 87108.

RECITALS

1. The Donor owns a tract of land located in Jefferson County, Montana, more particularly described in "Exhibit A," attached hereto and by reference made a part hereof (hereinafter the "Property").

2. Said Property contains features associated with the MacHaffie Archaeological Site which includes artifacts of significant archaeological value.

3. The Donor desires to preserve said archaeological features and artifacts for the general historical and cultural benefit of the people of Montana and the United States by donating said Property to the Conservancy

4. The Conservancy desires to acquire said Property to preserve and maintain said Property for posterity.

NOW THEREFORE, the parties agree as follows:

1. The Donor agrees to donate and convey to the Conservancy in fee simple title the Property and all existing archaeological structures and all rights, hereditaments and appurtenances thereunto belonging. The Donor further agrees that the Property shall be conveyed subject only to such easements, restrictions and other exceptions of record as will

not adversely affect the Conservancy's intended use of the Property as a cultural preserve or similar use.

2. In exchange for the donation, the Conservancy shall:

a. Manage the Property in such a way as to maintain the archaeological values thereof. Under the supervision of the Conservancy, professional archaeologists may be permitted to conduct scientific research on the property.

b. All artifacts and records will be donated to the Montana Historical Society.

c. Create a committee to advise the Conservancy on the management of the Property. Such committee shall consist of the Donor, professional archaeologists, interested local citizens, and other people with an interest in and knowledge of the Property.

d. Pay costs at closing associated with the transfer including the title insurance policy premium, recording fees, escrow fees, deed creation fees, survey costs totaling ~~$2,900.00~~ to Ries & Associates PC, appraisal costs up to ~~$350.00~~, and a real estate advisory fee of $1,200.00.

3. It is understood by both parties that should the Conservancy cease to exist, title to the Property shall be transferred to the Montana Historical Society.

4. It is understood by both parties that, with the input of the Conservancy, Les Davis shall have the opportunity to complete an archaeological research project within a small area adjacent to areas he has previously researched, for the balance of his natural life.

WITNESS the hand and seal of the Donor this 4th day of April, 2009.

Pamela Bompart

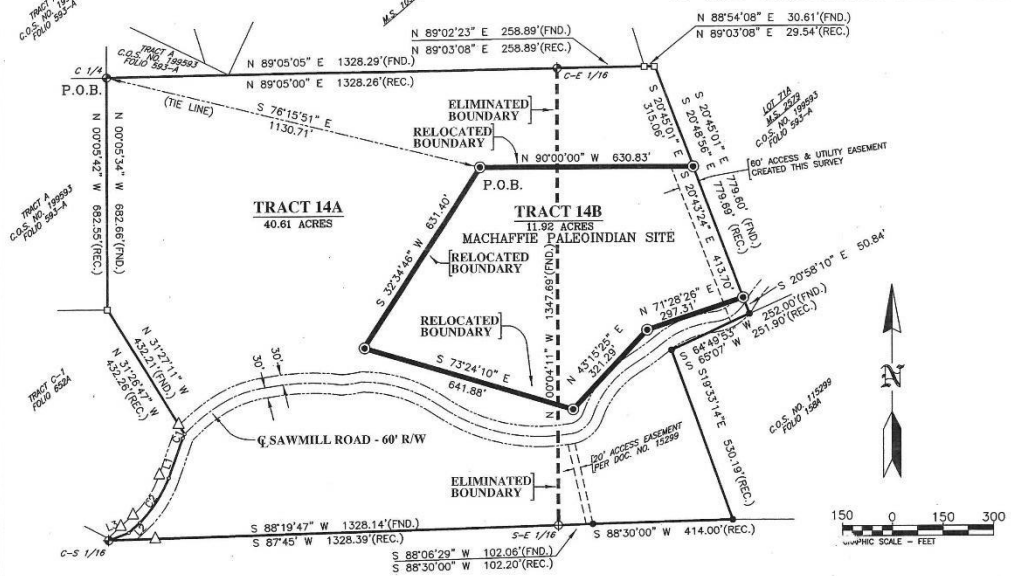
WITNESS the hands and seals of the Conservancy this 26th day of March, 2009.

The Archaeological Conservancy

BY James B. Walker
Vice President

CERTIFICATE OF SURVEY

PURPOSE: BOUNDARY RELOCATION
FOR: RUTH PAMELA BOMPART
& THE ARCHAEOLOGICAL CONSERVANCY



CURVE	RADIUS	ARC LENGTH	CHORD LENGTH
C1	91.11'	13.23'	13.22'
C2	322.52'	158.30'	156.71'

LINE	BEARING	DISTANCE
L1	N 19°14'56" E	125.33'
L2	N 47°17'07" E	44.32'
L3	N 69°20'58" E	63.32'

LEGAL DESCRIPTION: TRACT 14A

A TRACT OF LAND LOCATED IN THE SE 1/4 OF SECTION 13, TOWNSHIP 9 NORTH, RANGE 3 WEST, P.M. MONTANA, JEFFERSON COUNTY, MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE CENTER 1/4 CORNER OF SECTION 13;
THENCE N 89°05'05"E, 1328.29 FEET ALONG THE EAST–WEST MIDSECTION LINE;
THENCE N 89°02'23"E, 258.89 FEET ALONG THE EAST–WEST MIDSECTION LINE;
THENCE N 88°54'08"E, 30.61 FEET TO THE WEST PROPERTY LINE OF LOT 71A;
THENCE S 20°45'01"E, 315.06 FEET ALONG THE WEST PROPERTY LINE OF LOT 71A;
THENCE N 90°00'00"W, 630.83 FEET;
THENCE S 32°34'46"W, 631.40 FEET;
THENCE S 73°24'10"E, 641.88 FEET;
THENCE N 43°15'25"E, 321.29 FEET;
THENCE N 71°28'26"E, 297.31 FEET TO THE WEST PROPERTY LINE OF LOT 71A;
THENCE S 20°58'10"E, 50.84 FEET ALONG THE WEST PROPERTY LINE OF LOT 71A;
THENCE S 64°49'53"W, 252.00 FEET ALONG THE NORTH PROPERTY LINE OF C.O.S. NO. 115299;
THENCE S 19°33'14"E, 530.19 FEET ALONG THE WEST PROPERTY LINE OF C.O.S. NO. 115299;
THENCE S 88°30'00"W, 414.00 FEET;
THENCE S 88°06'29"W, 102.06 FEET;
THENCE S 88°19'47"W, 1328.14 FEET TO THE CENTERLINE OF SAWMILL ROAD;
THENCE N 69°20'58"E, 63.32 FEET ALONG SAID CENTERLINE;
THENCE N 47°17'07"E, 44.32 FEET ALONG SAID CENTERLINE;
THENCE ALONG SAID CENTERLINE ALONG A TANGENT CURVE TO THE LEFT HAVING A RADIUS OF 322.52 FEET, AN ARC LENGTH OF 158.30 FEET, A CHORD BEARING N 33°18'36"E, 156.71 FEET;
THENCE N 19°14'56"E, 125.33 FEET ALONG SAID CENTERLINE;
THENCE ALONG SAID CENTERLINE ALONG A TANGENT CURVE TO THE RIGHT HAVING A RADIUS OF 91.11 FEET, AN ARC LENGTH OF 13.23 FEET, A CHORD BEARING N 23°24'22"E, 13.22 FEET;
THENCE N 31°27'11"W, 432.21 FEET ALONG THE EAST PROPERTY LINE OF TRACT C–1, FOLIO 652A;
THENCE N 00°05'34"W, 682.66 FEET ALONG THE EAST PROPERTY LINE OF TRACT A C.O.S. NO. 199593 TO THE POINT OF BEGINNING. THE PARCEL OF LAND CONTAINS 40.61 ACRES, MORE OR LESS AND IS SUBJECT TO ALL EXISTING EASEMENTS, DOCUMENTS OF RECORD AND EASEMENTS SHOWN OF PLAT.

LEGAL DESCRIPTION: TRACT 14B

A TRACT OF LAND LOCATED IN THE SE 1/4 OF SECTION 13, TOWNSHIP 9 NORTH, RANGE 3 WEST, P.M. MONTANA, JEFFERSON COUNTY, MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE CENTER 1/4 CORNER OF SECTION 13; THENCE S 76°15'51"E, 1130.71 FEET TO THE POINT OF BEGINNING;
THENCE S 90°00'00"E, 630.83 FEET TO THE WEST PROPERTY LINE OF LOT 71A;
THENCE S 20°43'24"E, 413.70 FEET ALONG THE WEST PROPERTY LINE OF LOT 71A;
THENCE S 71°28'26"W, 297.31 FEET;
THENCE S 43°15'25"W, 321.29 FEET;
THENCE N 73°24'10"W, 641.88 FEET;
THENCE N 32°34'46"E, 631.40 FEET TO THE POINT OF BEGINNING. THE PARCEL OF LAND CONTAINS 11.92 ACRES, MORE OR LESS AND IS SUBJECT TO ALL EXISTING EASEMENTS, DOCUMENTS OF RECORD AND EASEMENTS SHOWN OF PLAT.

CERTIFICATE OF APPROVAL

I/WE, THE UNDERSIGNED PROPERTY OWNER, HEREBY CREATE/GRANT/PERMIT A 60' ACCESS AND UTILITY EASEMENT AS SHOWN AND DESCRIBED ON THIS CERTIFICATE OF SURVEY.

CERTIFICATE OF EXEMPTION: TRACT 14A AND TRACT 14B

I/WE, THE UNDERSIGNED, HEREBY CERTIFY THAT THE DIVISION OF LAND SHOWN ON THIS CERTIFICATE OF SURVEY IS EXEMPT FROM REVIEW AS A SUBDIVISION IN ACCORDANCE WITH THE PROVISIONS OF SECTION 76–3–207(1)(e) OF MCA, AS THIS IS A RELOCATION OF COMMON BOUNDARY LINES BETWEEN A SINGLE LOT WITHIN A PLATTED SUBDIVISION AND ADJOINING LAND OUTSIDE A PLATTED SUBDIVISION.

D.E.Q. EXEMPTIONS:

(1) I/WE, THE UNDERSIGNED, HEREBY CERTIFY THAT TRACT 14B IS EXEMPT FROM DEQ REVIEW IN ACCORD WITH ARM 17.36.605(2)(a), BECAUSE THIS IS A NEWLY CREATED PARCEL WITHOUT EXISTING FACILITIES FOR WATER SUPPLY, WASTEWATER DISPOSAL, OR SOLID WASTE DISPOSAL AND WATER SUPPLY, WASTEWATER DISPOSAL, OR SOLID WASTE DISPOSAL FACILITIES WILL NOT BE CONSTRUCTED ON THE PARCEL.

(2) I/WE, THE UNDERSIGNED, HEREBY CERTIFY THAT TRACT 14A ARE EXEMPT FROM DEQ REVIEW IN ACCORD WITH MCA 76.4.102(16), BECAUSE THEY ARE PARCELS 20 ACRES OR GREATER, EXCLUSIVE OF PUBLIC ROADWAYS.

CERTIFICATE OF COUNTY TREASURER

I, HEREBY CERTIFY, PURSUANT TO SECTION 76–3–611 (1)(B) OF MCA, THAT ALL REAL PROPERTY TAXES AND SPECIAL ASSESSMENTS ASSESSED AND LEVIED ON THE LAND DESCRIBED ON THIS PLAT AND ENCOMPASSED BY THE PROPOSED ' BOUNDARY RELOCATION ' HAVE BEEN PAID.

GEOCODE 51178513403010000 GEOCODE 51178513403080000

DATED THIS _____ DAY OF _____, 200___.

_____
TREASURER, JEFFERSON COUNTY, MONTANA

CERTIFICATE OF EXAMINING LAND SURVEYOR

REVIEWED FOR ERRORS AND OMISSIONS THIS

_____DAY OF _____, 200___,
PURSUANT TO SECTION 76–3–611(2)(A), MCA.

_____
EXAMINING LAND SURVEYOR
REG. NO._____

CERTIFICATE OF FILING

FILED FOR RECORD _____ DAY OF _____,
200___, AT _____.

_____
CLERK AND RECORDER, JEFFERSON, COUNTY, MONTANA

CERTIFICATE OF SURVEYOR

MONTANA
WILLIAM J. Ries 14016LS LICENSED LAND SURVEYOR

_____
WILLIAM J. RIES (LIC. NO. 14016
PROFESSIONAL LAND SURVEYOR
DATE: _____

LEGEND

- ◉ SET 5/8" REBAR W/R.P.C. (WILLIAM J. RIES–14016LS)
- □ FND. 5/8" REBAR W/Y.P.C. (MORRISON & MAIERLE)
- ● FND 5/8" REBAR W/Y.P.C. (RIES–4125S)
- ◦ CALCULATED POSITION, NOTHING FOUND OR SET
- ⊕ FND 3.5 IN. ALUMINUM CAP(BLM)
- ⊕ FND 5/8" REBAR W/Y.P.C. (ERICKSON–2354S)
- △ FND 5/8" REBAR W/Y.P.C. (SCHAUBER–5430LS)

BASIS OF BEARINGS
G.P.S., ROTATED TO GEODETIC NORTH

_____
OWNER: RUTH PAMELA BOMPART

ON THIS _____ DAY OF _____, 200___, BEFORE ME A NOTARY PUBLIC FOR THE STATE OF MONTANA PERSONALLY APPEARED THE ABOVE NAME KNOWN TO ME TO BE THE PERSON WHOSE NAME IS SUBSCRIBED TO THE WITHIN INSTRUMENT, AND ACKNOWLEDGED TO ME THAT SHE EXECUTED THE SAME.

_____
NOTARY PUBLIC FOR THE STATE OF MONTANA
PRINTED NAME OF NOTARY
RESIDING AT_____
MY COMMISSION EXPIRES_____

1/4	SEC.	T.	R.
	13	9N	3W

P.M. MONTANA,
JEFFERSON COUNTY

PREPARED BY:
RIES & ASSOCIATES, PC.
6850 GREEN MEADOW DR.
HELENA, MONTANA 59602
(406)458–5243 * FAX: (406)458–8699

SHEET 1 OF 1
DOCUMENT NO. _____

DATE: SEPTEMBER 22, 2008
DRAFTED BY: PJW
FIELD BY: PJW, MJR
JOB NO.: 08574

The Archaeological Conservancy
5301 Central Avenue NE, Suite 902
Albuquerque, New Mexico 87108-1517
(505) 266-1540

December 9, 2005

Mr. Les Davis
Ms Pamela Bompart
P.O. Box 67
Jefferson City, MT 59638

Dear Les and Pamela:

I'm glad that our board member Roddy Stanton and I had an opportunity to see the MacHaffie site and to spend a little time talking with you, Les about the long term preservation and protection of the resource.

I was really impressed with the information in the National Register nomination and in what other archaeological professionals had to say about the site including my discussions with Stan Wilmuth and Ruthann Knudson The site is really unique and I believe it has the potential to yield significant information about the past. I commend you both for your interest in preserving and protecting this nationally significant site.

As I mentioned in my conversation with Les, I will outline in this letter a number of preservation options that may interest you.

The Archaeological Conservancy is a national nonprofit organization dedicated to the long term preservation of significant archaeological resources. We acquire archaeological properties, set up management plans and security systems utilizing volunteer site stewards. Although we don't do any excavating ourselves, all of our preserves are available for research under controlled conditions. Over the past 25 years we have established over 310 preserves in 38 states. Although we currently have no preserves in Montana, we are interested in beginning a program in your state. We get most of our funds from foundations, corporations and individuals. Nationwide, we have a membership of 24,000 people who receive our quarterly publication *American Archaeology*.

Paleo-Indian sites are considered by the organization to be one of our highest national priorities, because there are so few known sites from the period and we have so much to learn about the life ways of Paleo-Indian people.

The MacHaffie site is clearly worthy of permanent preservation. Here are some options available to you that could accomplish that goal:

Donation: Donating your interest in the site to The Archaeological Conservancy, either as a gift in your lifetime, or as a bequest, would have significant tax benefits. You should be able to take as a deduction the full fair market value of the property, based on an appraisal, as a tax deduction. If you could not use the full amount of the deduction in the year the gift is made, under some circumstances, any unused deduction can be carried forward into the next five tax years. You should consult with your tax advisor to see what kind of impact a donation might have on your tax situation. A bequest could serve to reduce estate taxes.

If you were to decide on a donation or bequest, the Conservancy would pay all costs associated with the transaction, including appraisal fees, survey costs, closing costs and legal fees you might incur. I understand that since the site is part of a larger parcel, it may be necessary to first subdivide it out. The Conservancy has been successful in other states in obtaining subdivision exemptions from city, county and state governments for the purpose of creating archaeological preserves, by applying for a variance. We would be willing to undertake the time and expense to subdivide the parcel, should you elect to donate it either as a gift during your lifetime, or as a bequest.

Bargain-sale-to-charity: This option is part purchase/part donation. Working from an appraisal, the Conservancy would pay you less than appraised value for the lot. The difference between the amount we pay you and appraised value would then be considered a donation to the Conservancy. Any capital gain would only be computed on the cash portion of the transaction.

As an example, let's say that you decided on a 2-acre lot. The lot appraises for $90,000.00. We agree on a Bargain-sale-to-charity price of $40,000.00. You would receive the cash at closing and you could claim a $50,000.00 tax deduction. Just like the full donation, under some circumstances, any unused deduction can be carried forward into the next five tax years.

Use of the land: Under either of these options, we can make provisions in the documents which would allow you to use the property for open space purposes (hiking, picnicking, horseback riding etc.) during your lifetime.

Site Security: In my conversation with Les, he asked a question I hear frequently from landowners, "How can the Conservancy possibly protect this resource any better than we can?" I told him that the answer is," We can't!" You are the best stewards of the resource since you live nearby and can drive past the property on a regular basis. We would rely on you to assist us in overseeing the property. We would also probably need to recruit additional site stewards

from the neighbors living adjacent to the site to supplement your surveillance activities. This is how we protect all of our 300+ preserves.

The main reason I can give you to persuade you to join us in creating a permanent archaeological preserve at the MacHaffie site, is the establishment of a protection program that will outlive all of us. If your heirs don't share the same passion you have for preserving prehistory, there is nothing to prevent them from turning the land into a subdivision. I realize that Montana has a burial law, but it is possible that a developer might not impact burials at this site. By institutionalizing ownership of the site in the Conservancy, your goal of preserving the resource wouldn't end when you pass away.

Management Plan: With your help and participation, The Conservancy would develop a 100-year Management Plan for the preserve addressing site security, access, ground cover and erosion control. I have included a sample Management Plan with this letter so you can see what a Management Plan looks like.

I would be happy to answer any questions you might have about either of the options I have outlined. I know that these kinds of decisions take time. I am willing to proceed at your pace. I would be happy to return to Montana and speak to you in person, or we can correspond by mail, e-mail tacsw@nm.net or phone (505) 266-1540.

Thank you for your interest in our preservation programs.

Sincerely,

James B. Walker
SW Regional Director

cc: Roddy Stanton

LIMITED DATA RECOVERY PROPOSAL FOR ARCHAEOLOGICAL SITE 24JF4: MACHAFFIE

prepared by

Patrick Rennie, Archaeologist
Montana Department of Natural Resources and Conservation
1539 1th Avenue
Helena, MT 59620-1601

for

The Archaeological Conservancy

August 2017

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1.0 INTRODUCTION

The MacHaffie Site (24JF4) in southwestern Montana is likely the best known and poorly documented archaeological site in the northwest Plains. It was initially test excavated in 1951. Dr. Leslie B. Davis conducted short-term excavations in the site in 1989-1991, and ca. 2008-2010. Although Dr. Davis defined what he believed to be a Folsom component based on C-14 dates (but no associated diagnostic artifacts), the high water table at the site precluded his thorough examination of this component. It also obstructed his ability to determine if older and more deeply buried cultural remains are present below the supposed Folsom layer (Figure 1).

Currently, probably due to on-going drought conditions coupled with numerous private wells associated with adjoining subdivisions, the water table appears to have dropped substantially. In an effort to meet Dr. Davis goal, and adequately conclude 66 years of archaeological work at MacHaffie, I propose to re-open an existing 2 x 4 m excavation block (Figure 2). Excavation will proceed downward if possible until either the water table or bedrock is encountered. It should be noted, that bedrock is likely 50 cm or less below the currently excavated depth. The base of the existing 2 x 4 m trench is currently covered with plywood, plastic sheeting, and a shallow layer of excavated sediment. The primary objective of the proposed work, as well as past investigations, is adequately characterize the nature of archaeologi¬cal deposits in the site.

2.0 PROPOSED RESEARCH OBJECTIVES

Following are a series of research questions proposed here for additional data recovery efforts, and past work conducted in site 24JF4. These questions are separated into two categories. The first category comprises qualitative questions intended to allow a better understanding of the horizontal and vertical patterning of cultural materials throughout the portion of the site to be investigated site. The second category of questions are cultural/historical in nature and attempt to establish what archaeologically defined group(s) occupied sites 24JF4 and what activities took place in the site. If the qualitative questions, when applied to collected data, indicate that cultural materials retain stratigraphic integrity the cultural/historical questions can be addressed, and may, at a minimum, provide information concerning whether or not any

observed patterns in the site is common among similar occupation sites in the northern Plains and/or Rocky Mountain Front with and without respect to time and space: These questions are:

Qualitative research questions:

1) Do the cultural materials in the sites retain stratigraphic integrity?

2) Do quantitative and qualitative correlations exist among cultural components?

Cultural/historical research questions:

1) What are the archaeological complexes/phases represented by cultural deposits in the site?

2) What is the ages and seasons of site use?

3) What is the nature and relative intensities of cultural activities that took place in the site?

4) Do significant differences in the nature or intensity of cultural activities within 24JF4 and other comparable sites in the local area and, the Rocky Mountain front and adjoining northern Plains exist?

5) If differences in the range or intensity of cultural activities appear, when compared to other comparable sites, what might the differences reflect?

6) What spatial patterning exists in the horizontal distribution of various classes of cultural material in the site? What might such patterning suggest in terms of the cultural activities reflected by those materials?

7) Do significant positive or negative correlations in the densities of various classes of cultural materials exist in the site? What might such correlations suggest?

8) If sourceable lithic materials are recovered from the site, how do those materials correlate to distribution of sourceable lithic raw materials, with regard to time and space, in other areas of the northern Plains?

9) Does plant resource use appear to change over time in the site? If so how does this relate to currently recognized patterns of plant utilization among prehistoric humans in the northern Plains and adjoining mountainous areas?

10) Do the kinds or frequencies of heating/cooking facilities change stylistically over time in the site? If so, how does this relate to currently recognized patterns among archaeologically defined units in the northern Plains?

3.0 PROPOSED DATA RECOVERY METHODS, SAMPLING STRATEGIES, AND SAMPLING SIZES

The ability to satisfactorily address most of the previously defined cultural/historical research questions is dependent upon the answer to qualitative question # 1.

1) an existing excavation block measuring 2 m wide by 4 m in length and consisting of 8 individual 1 square meter units, will be excavated an additional 50 cm below the present excavated depth (see Figure 2), or until bedrock or the water table is encountered;

2) excavations will proceed with hand trowels in 10 cm deep vertical levels unless evidence is identified to modify this approach. Exposed cultural materials will be mapped in-place (per 10 cm vertical level) to the extent possible;

3) All excavated sediments will be screened through 1/8" and 1/4" mesh screen and all retained materials will be bagged and identified to their horizontal and vertical proveniences;

4) Bulk fill from all heating/cooking/storage facilities encountered during excavation should be collected and subjected to floatation studies. Bulk soil samples will be collected from activity floors if heating/cooking/storage facilities are not identified. Additionally, any heating/cooking/storage facility encountered during excavation will be described following definitions provided by Fredlund et al (1983);

5) All fire-cracked rock recovered during excavation will be weighed, described and analyzed as to material type and fracture pattern (Rennie 2001);

6) Chipped stone tools and debitage will be defined and analyzed following procedures defined in Rennie (2002). A sample of obsidian and dacite recovered during excavation will be sourced, and if appropriate, submitted for hydration rind thickness analysis;

7) Faunal materials will be analyzed as to species, skeletal element, and if possible, season of death;

8) Profiles of one or more of the excavation block's walls will be made, and soils and soil formation processes will be analyzed by a competent geomorphologist;

9) During excavation, soil samples will be collected from the excavation block wall in 10 cm increments for a paleoenvironmental study.

A report will be generated within one year of proposed excavation work. The report will detail the history of work at MacHaffie as well as a detailed discussion of geomorphology, paleoenvironmental data, faunal analysis, macrobotanical information, and chipped stone analysis. All cultural materials, excluding FCR and those materials or portions of materials which will be destroyed through analyses, will be reposited in the Montana State Historical Society museum, unless an alternative repository is approved by the Archaeological Conservancy. All fieldwork and reporting costs will be volunteered. Further, as much specialized analysis work as possible will be volunteered by one or more experts in a relevant field. Analyses costs for services not volunteered will be underwritten by the site donor, Pamela Bompart.

REFERENCES CITED

Fredlund, L., D. Herbort, and G. Munson
1983 Archaeological Investigations at the North Antelope Mine, Eastern Powder River Basin, Wyoming: Report of Phase II Mitigation Results. Consultant's report (GCM Services, Inc., Butte) prepared for the North Antelope Coal Company, Denver.

Rennie, P.J.
2001 The Interpretive Value of Fire-Cracked Rock. Archaeology in Montana 42(1):65-90.

2002 Department of Natural Resources and Conservation Manual for Collecting, Organizing, Describing, Coding and Tracking Cultural Materials: Definitions and Procedures, Vol. I. Unpublished ms. on file with the DNRC, Helena, Montana.

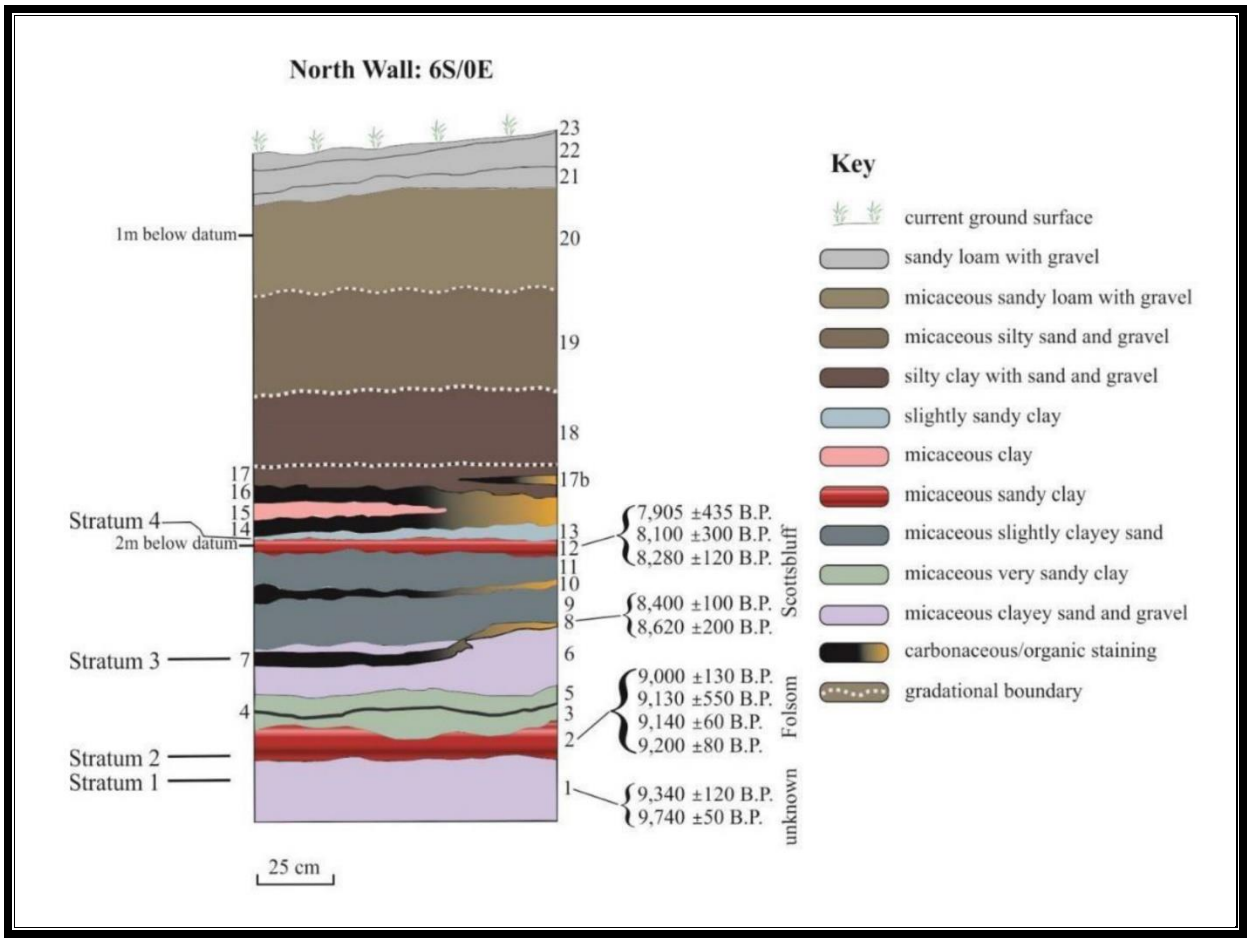


Figure 1: Soil Profile for 24JF4 showing dated Cultural Components.

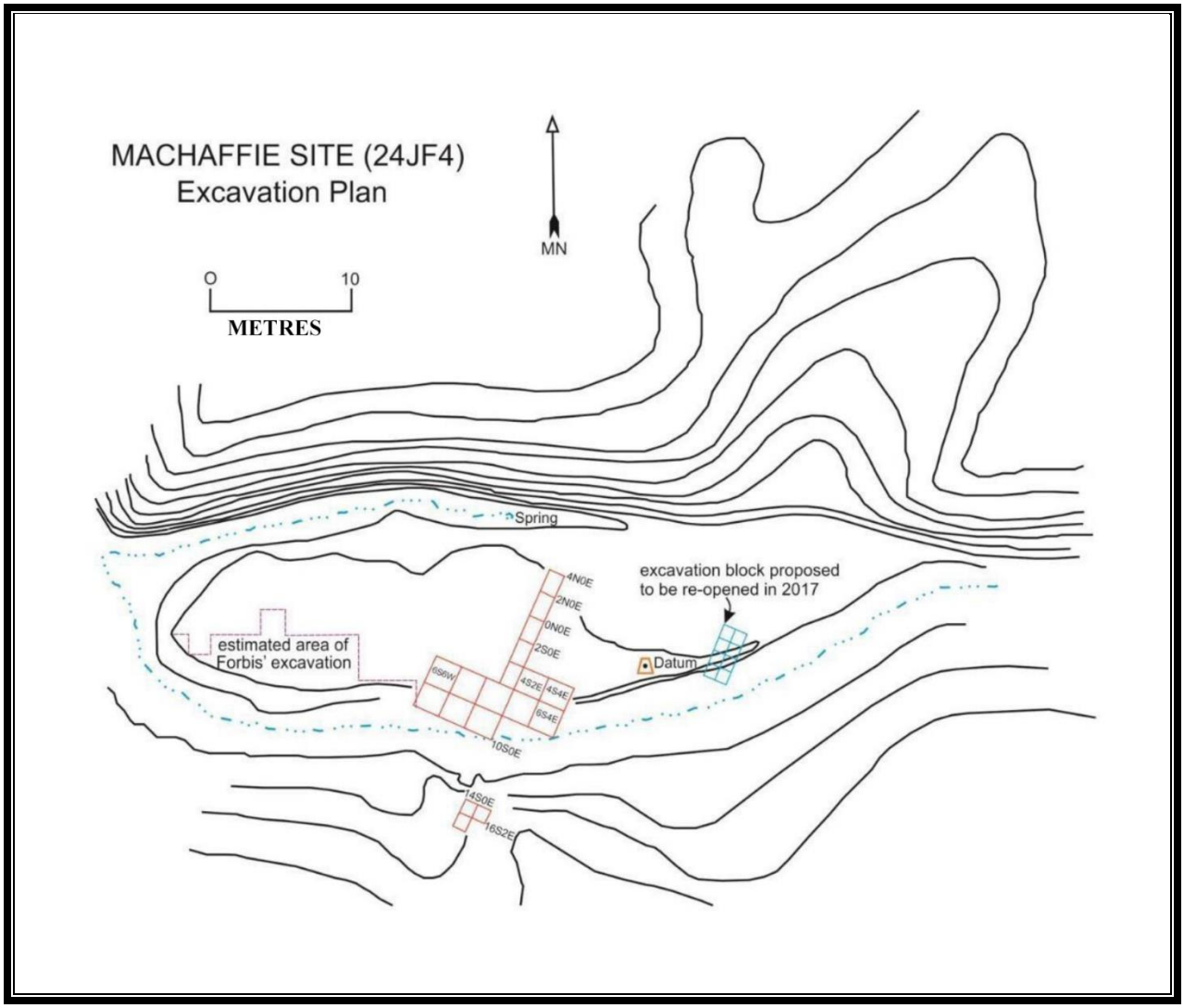


Figure 2: Excavation plan map for 24JF4

DEED OF GIFT/DONATION

University of Montana Collections Facility
University of Montana
Dept. of Anthropology, SS Bldg. Rm 36
32 Campus Drive
Missoula, MT 59812

UM Accession Number: 2010.09.33

Donor(s): Pamela Bompart

Address: P.O. Box 67, Jefferson City, MT 59638

Phone: 406-933-5704 Email: N/A

I, the undersigned, do hereby irrevocably and unconditionally give, transfer, and assign to the University of Montana by way of gift, all right, title, and interests in, to, and associated with the objects described below:

All MacHaffie Site (24JF4) cultural materials recovered 1947-1951 (Wessley Bliss, Edmund and June MacHaffie, Richard Forbis); 1989-2010 (Pamela Bompart and Leslie B. Davis); 2017-2018 (Patrick Rennie). See attached list of Bins A-I contents as well as associated Excel artifact catalogue tables and technical report (Rennie et al. 2022).

I hereby notify the University of Montana that I am the lawful owner of the above described items of personal property, and I have absolute authority to, and hereby do, effect transfer of ownership of all right, title, and interest thereof to the University of Montana. Should the University of Montana Collections Facility loose funding or otherwise become deprived of its ability to provide current (2022) levels of security, climate control, and artifact protection, the University of Montana agrees to transfer the MacHaffie Site materials to the BLM Billings Curation Center for storage and protection.

Donor Signature Pamela Bompart Date 10/10/22

_____ Date _____

The University of Montana Collections Facility, on behalf of the University of Montana, has received the above described objects of personal property.

UMACF Curator [signature] Date 11/21/2022

Artifact Donation Form to University of Montana.

APPENDIX 2

John Byrd Collection: 1952

A Visit to the MacHaffie Site, Spring 1952

John N. Byrd (April 10, 2021)

With an avid interest in Montana's pre-history, I was very intrigued by the newspaper articles on the excavations at the MacHaffie Site conducted by Richard Forbis. We lived at Canyon Ferry and in the late spring of 1952 my parents took me to visit the site. The site had retained most of its profile features though the snow melt and spring rains had eroded it considerably. Exposed on the spoil piles left from excavations were several flakes and worked pieces of stone. I collected about eight of these. There were also several small piles of bone fragments that were decomposing with exposure to the elements. The bone was probably enough volume to fill a water pail.

I have donated the pieces I collected to the MacHaffie Collection. The collection will be reposited at the University of Montana through Patrick Rennie (UM Accession #2010.99.33). The lithic material constituting one of the bifaces, #154, has always intrigued me. I have never seen another sample of it in ensuing years from any archaeological context.

John Byrd Collection Bifaces: Metric and Nonmetric Data

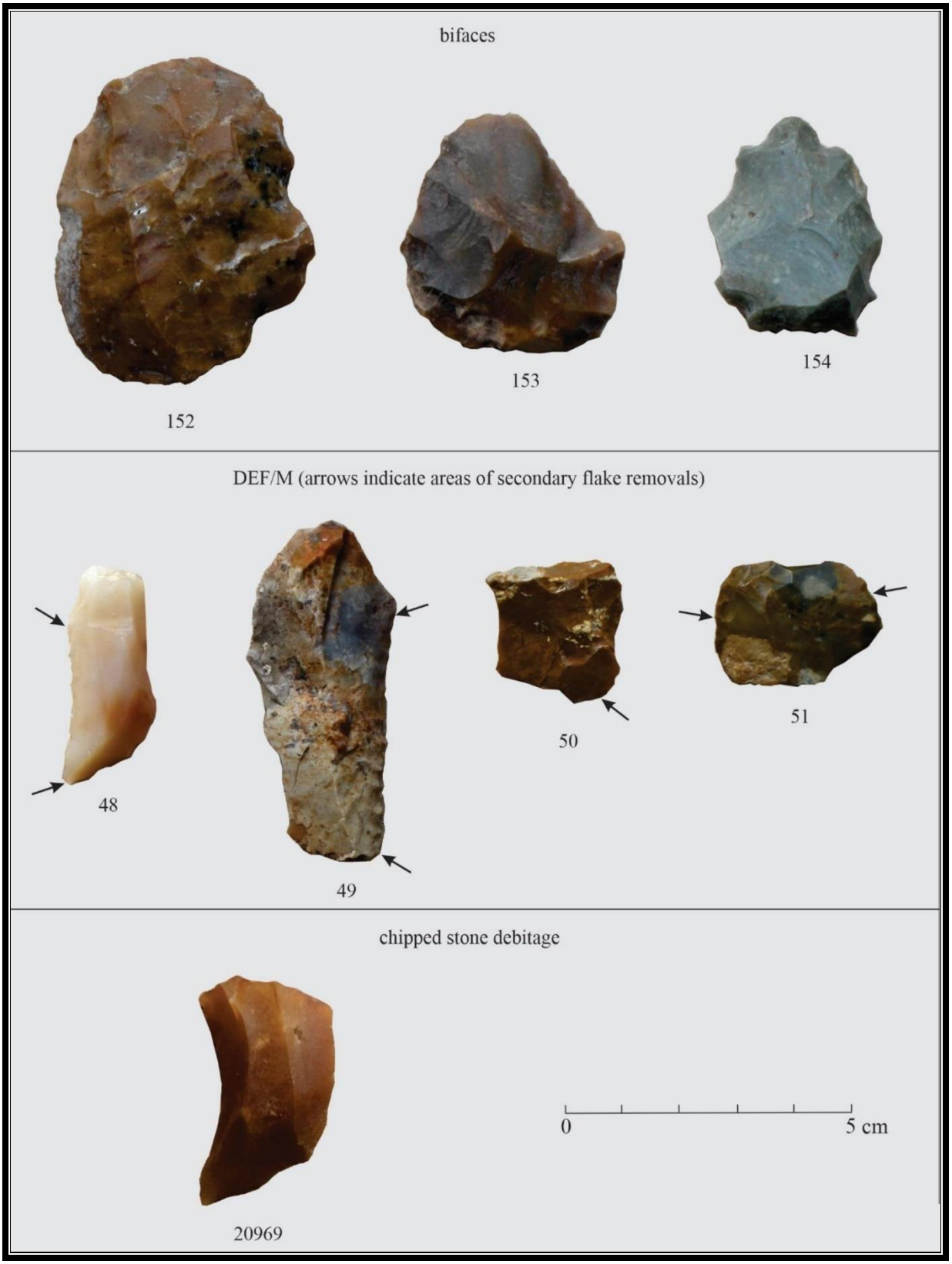
Record #	Provenience	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
Record #	surface of Forbis' excavated sediments	1	flake	ovate	bi-convex	II	complete	minor retouch on interior surface of one edge	YBCCS1b	5.94	4.76	1.65	48.6
152	surface of Forbis' excavated sediments	1	indeterminate	ovate	bi-convex	II	complete	none	YBCCS1d	4.24	3.51	1.01	14.46
153	surface of Forbis' excavated sediments	1	indeterminate	ovate	bi-plano	II	complete	none	RHY18	3.93	3.14	0.76	11.64

Record #	Comments
152	Prominent bulb of percussion. John Byrd collection, 1952. Recovered from Forbis' excavated and screened sediments from 1951.
153	Possible medium-sized projectile point preform attempt. John Byrd collection 1952. Recovered from Forbis' excavated and screened sediments from 1951.
154	Only known piece of this material-type from MacHaffie. John Byrd collection 1952. Recovered from Forbis' excavated and screened sediments 1951.

John Byrd Collection DEF/M: Metric and Nonmetric Data

Record #	Provenience	CMU	Debitage Type	Reduction Stage	Exterior Surface Flake Scar Count	Flake Scare Orientation	Lithic Material Code	Flake Shape	Flake Condition	Flake Termination Type	Platform Type	Flake Type
48	surface of Forbis' excavated sediments	2	flake	secondary	2	parallel	CCCS7	elongate	complete	feather	flat	shaping/thinning
49	surface of Forbis' excavated sediments	4	flake	secondary	2	parallel	CCCS6	elongate	complete	feather	faceted	shaping/shining
50	surface of Forbis' excavated sediments	4	flake	secondary	3	intersecting	YBCCS1b	ovate	complete	feather	flat	shaping/shining
51	surface of Forbis' excavated sediments	4	flake	secondary	3	intersecting	YBCCS8	ovate	complete	indeterminate	indeterminate	shaping/shining

Record #	Type of Modification	Number of Retouched Edges	Size-Grade	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)	Comments
48	unifacial flaking	2	2	3.83	1.50	0.82	4.62	Patterned but minimal micro-flake removals from one segment of interior surface of a lateral edge and exterior surface of distal end. John Byrd collection, 1952. Recovered from Forbis' excavated and screened sediments 1951.
49	unifacial flaking	1	2	5.73	2.40	0.85	12.32	Patterned micro-flake removals along full length of exterior surface of one lateral edge. John Byrd collection, 1952. Recovered from Forbis' excavated and screened sediments 1951.
50	unifacial flaking	1	2	2.60	2.42	0.82	5.63	Patterned micro-flake removals from exterior surface of both lateral edges. May have been intended for a small-size projectile point preform. John Byrd collection, 1952. Recovered from Forbis' excavated and screened sediments 1951.
51	unifacial flaking	2	2	2.12	2.72	0.63	4.93	Patterned micro-flake removals from exterior surface of both lateral edges. May have been intended for a small-size projectile point preform. John Byrd collection, 1952. Recovered from Forbis' excavated and screened sediments 1951.



Lithic items collected by John Byrd in 1952 from Forbis' excavated sediments (1951) at 24JF4. All pieces lack contextual integrity.

APPENDIX 3

Data Tables

Table 1: Faunal Resources Expected to Occur within a Ten Mile Radius of 24JF4 from Early Historic Times to the Mid-Holocene

BIRDS + avian species expected to occur in the study area throughout the year

Accipitriformes	Forester's tern - *Sterna forsteri*
+bald eagle *Haliaeetus - leucocephal-us*	Franklin's gull - *Larus pipixcan*
+golden eagle - *Aquila chrysaetos*	greater yellowlegs - *Tringa melanoleuca*
Cooper's hawk - *Accipiter cooperii*	herring gull - *Larus argentatus*
ferruginous hawk - *Buteo - regalis*	killdeer - *Charadrius vociferus*
+northern goshawk - *Accipiter gentilis*	least sand - *Calidris minutilla*
red-tailed hawk - *Buteo jamaicensis*	lesser yellowlegs - *Tringa flavipes*
rough-legged hawk - *Buteo lagopus*	long-billed curlew - *numenius americanus*
sharp-shinned hawk - *Accipiter striatus*	long-billed dowitcher - *Limnodromus scolopaceus*
Swainson's hawk - *Buteo swainsoni*	marbled godwit - *Limosa fedoa*
northern harrier - *Circus cyaneus*	mountain plover - *Charadrius montanus*
Osprey - *pandion haliaetus*	red-necked phalarope - *Phalaropus lobatus*
Falconiformes	ring-billed gull - *Larus delawarensis*
American kestrel - *Falco sparverius*	semipalmated plover - *Charadrius semipalmatus*
merlin - *Falco columbarius*	semipalmated sandpiper - *Calidris pusilla*
peregrine falcon - *Falco peregrinus*	solitary sandpiper - *Tringa solitaria*
+prairie falcon - *Falco mexicanus*	spotted sandpiper - *Actitis macularia*
Anseriformes	western sandpiper - *Calidris mauri*
American wigeon - *Anas americana*	willet - *Catoptrophorus semipalmatus*
Barrow's goldeneye - *Bucephala islandica*	Wilson's phalarope - *Phalaropus tricolor*
blue-winged teal - *Anas discors*	**Columbiformes**
bufflehead - *Bucephala albeola*	mourning dove - *Zenaida macroura*
+Canada goose - *Branta canadensis*	**Apodiformes**
cinnamon teal - *Anas cyanoptera*	calliope hummingbird - *Stellula calliope*
common goldeye - *Bucephala clangula*	rufous hummingbird - *Selasphorus rufus*
common merganser - *Mergus merganser*	**Coraciformes**
gadwall - *Anas strepera*	+belted kingfisher – *Ceeyle alcyon*
green-winged teal - *Anas crecca*	**Piciformes**
hooded merganser - *Lophodytes cucullatus*	black-backed woodpecker - *Picoides arcticus*
+mallard - *Anas platyrhynchos*	+downy woodpecker - *Picoides pubescens*
northern pintail - *Anas acuta*	+hairy woodpecker - *Picoides villosus*
northern shoveler - *Anas clypeata*	Lewis' woodpecker - *Melanerpes lewis*
snow goose - *Chen caerulescens*	pileated woodpecker - *Dryocopus pileatus*
trumpeter swan - *Cygnus buccinator*	+belted kingfisher - *Ceeyle alcyon*
tundra swan - *Cygnus columbianus*	**Piciformes**
Galliformes	black-backed woodpecker - *Picoides arcticus*
+blue grouse - *Dendragapus obscurus*	+downy woodpecker - *Picoides pubescens*
+ruffed grouse - *Bonasa umbellus*	+hairy woodpecker - *Picoides villosus*
+sharp-tailed grouse - *Tympanuchus phasianellus*	Lewis' woodpecker - *Melanerpes lewis*
+spruce grouse - *Dendragapus canadens-is*	pileated woodpecker - *Dryocopus pileatus*
Charadriiformes	**Piciformes (con't)**
American avocet - *Recurvirostra americana*	+northern flicker - *Colaptes auratus*
black tern - *Chlidonias niger*	red-headed woodpecker - *Melanerpes erythrocephalus*
Bonaparte's gull - *Larus philadelphia*	three-toed woodpecker - *Picoides tridactylus*
California gull - *Larus californicus*	yellow-bellied sap sucker - *Sphyrapicus varius*
Caspian tern - *Sterna caspia*	**Cathartiformes**
common snipe - *Gallinago gallinago*	turkey – *Catharies aura*

Table 1: Faunal Resources Expected to Occur within a Ten Mile Radius of 24JF4 from Early Historic Times to the Mid-Holocene (con't)

BIRDS + avian species expected to occur in the study area throughout the year

Pelicaniformes	**Passeriformes**
American white pelican - *Pelecanus erythrorhynchos*	cedar waxwing - *Bombycilla cedrorum*
black-crowned night-heron - *Nycticor-ax nycticorax*	chestnut-collared longspur - *Calcarius ornatus*
great blue heron - *Ardea herodias*	chipping sparrow *(Spizella passerina*
Suliformes	+Clark's nutcracker - *Nucifraga columbiana*
double-crested cormorant - *Phalacrocorax auritus*	clay-colored sparrow - *Spizella pallida*
Gruiformes	cliff swallow - *Hirundo pyrrhonota*
American coot - *Fulica americana*	common grackle - *Quiscalus quiscula*
sandhill crane - *Grus canadensis*	+common raven - *Coryus corax*
Podicipediformes	common redpoll - *Carduelis flammea*
eared grebe – *Podicepes nigricollis*	common yellowthroat - *Geothlypis trichas*
horned grebe – *Podicpedes auritus*	dark-eyed junco - *Junco hyemalis*
pied-billed grebe – *Podilymbus podic-eps*	dusky flycatcher - *Empidonax oberholseri*
western grebe – *Aechmophorus occidenttalis*	eastern kingbird - *Tyrannus tyrannus*
Strigiformes	evening grosbeak - *Coccothraustes vespertinus*
+burrowing owl - *Athene cunicularia*	fox sparrow - *Passerella iliaca*
flammulated owl - *Otus asia*	golden-crowned kinglet - *Regulus satrapa*
+great gray owl - *Strix nebulosa*	gray catbird - *Dumetella carolinensis*
+great horned owl - *Bubo virginianus*	gray-crowned rosy finch - *Leucosticte arctoa tephrocotis*
+long-eared owl - *Asio otus*	+gray jay - *Perisoreus canadensis*
+northern pygmy owl - *Glaucidium gnoma*	green-tailed towhee - *Pipilo chlorurus*
+northern saw-whet owl - *Aegolius acadicus*	Hammond's flycatcher - *Empidonax hammondii*
+short-eared owl - *Asio flammeus*	Harris' sparrow - *Zonotrichia querula*
western screech owl - *Otus kennicottii*	hermit thrush - *Catharus guttatus*
Caprimulgiformes	horned lark - *Eremophila alpestris*
common nighthawk - *Chordeiles minor*	house finch - *Carpodacus mexicanus*
Passeriformes	house wren - *Troglodytes aedon*
+American crow - *Corvus brachyrhynchos*	lapland longspur - *Calcarius lapponicus*
American goldfinch - *Carduelis tristis*	lark bunting - *Calamospiza melanocorys*
American dipper - *Cinclus mexicanus*	lark sparrow - *Chondestes grammacus*
American redstart - *Setophaga ruticilla*	least flycatcher - *Empidonax minimus*
American robin - *Turdus migratorius*	Lincoln's sparrow - *Melospiza lincolnii*
bank swallow - *Riparia riparia*	loggerhead shrike - *Lanius ludovicianus*
American tree sparrow - *Spizella arborea*	luzuli bunting - *Passerina amoena*
barn swallow - *Hirundo rustica*	Macgillivray's warbler - *Oporornis tolmiei*
+black-billed magpie - *Pica pica*	marsh wren - *Cistothorus palustris*
+black-capped chickadee - *Parus atricapillus*	McCown's longspur - *Calcarius McCownii*
black-headed grosbeak - *Pheucticus melanocephalus*	mountain bluebird - *Sialia currucoides*
black rosy finch - *Leucosticte arctoa atrata*	+mountain chickadee - *Parus gambeli*
bobolink - *Dolichonyx oryzivorus*	northern oriole - *Icterus galbula*
Bohemian waxwing - *Bombycilla garrulus*	northern rough-winged swallow - *Stelgidopteryx serripennis*
Brewer's blackbird *(Euphagus cyanocephalus*	northern shrike - *Lanius excubitor*
Brewer's sparrow - *Spizella breweri*	northern waterthrush - *Seiurus noveboracensis*
brown creeper - *Certhia americana*	olive-sided flycatcher - *Conopus borealis*
brown-headed cowbird - *Molothrus ater*	orange-crowned warbler - *Vermivora celata*
canyon wren - *Catherpes mexicanus*	ovenbird - *Seiurus aurocapillus*
Cassin's finch - *Carpodacus cassinii*	pine grosbeak - *Pinicola enucleator*

Table 1: Faunal Resources Expected to Occur within a Ten Mile Radius of 24JF4 from Early Historic Times to the Mid-Holocene (con't)

BIRDS + avian species expected to occur in the study area throughout the year

Passeriformes (con't)	**MAMMALS (con't)**
pine siskin - *Carduelis pinus*	Gapper's red-backed vole - *Clethrionomys gapperi*
pinyon jay - *Gymnorhinus cyanocephalus*	mountain phenacomys - *Phenacomys intermedius*
+pygmy nuthatch - *Sitta pygmaea*	meadow vole - *Microtus pennsylvanicus*
+red-breasted nuthatch - *Sitta canadensis*	mountain vole - *Microtus montanus*
red crossbill - *Loxia curvirostra*	long-tailed vole - *Microtus longicaudus*
red-eyed vireo - *Vireo olivaceus*	Richardson vole - *Microtus richardsoni*
red-winged blackbird - *Agelaius phoeniceus*	sagebrush vole - *Lagurus curtatus*
rock wren - *Salpinctes obsoletus*	deer mouse - *Peromyscus maniculatus*
ruby-crowned kinglet - *Regulus calendula*	northern grasshopper mouse - *Onychomys leucogaster*
rufous-sided towhee - *Pipilo erythrophthalmus*	house mouse - *Mus musculus*
sage thrasher - *Oreoscoptes montanus*	bushy-tailed wood rat - *Neotomoa cinerea*
savannah sparrow - *Passerculus sandwichensis*	pika - *Ochontona priniceps*
Say's phoebe - *Sayornis saya*	least chipmunk - *Eutamias minimus*
snow bunting - *Plectrophenax nivalis*	yellow-pine chipmunk - *Eutamias amoenus*
solitary vireo - *Vireo solitarius*	red-tailed chipmunk - *Eutamias ruficaudus*
Song sparrow - *Melospiza melodia*	red squirrel - *Tamiasciurus hudsonicus*
+Steller's jay - *Cyanocitta stelleri*	northern flying squirrel - *Glaucomys sabrinus*
Swainson's thrush - *Catharus ustulatus*	golden-mantled squirrel - *Citellus lateralis*
Tennessee warbler - *Vermivora peregrina*	Richardson's ground squirrel - *Spermophilus richardsonii*
Townsend's solitaire - *Myadestes townsendi*	northern pocket gopher - *Thomomys talpoides*
Townsend's warbler - *Dendroica townsendi*	black-tailed prairie dog - *Cynomys ludovicianus*
tree swallow - *Tachycineta bicolor*	yellow-bellied marmot - *Marmota flaviventris*
veery - *Catharus fuscescens*	Nuttall's cottontail - *Sylvilagus nuttallii*
vesper sparrow - *Pooecetes gramineus*	snowshoe hare - *Lepus americanus*
violet-green swallow - *Tachycineta thalassina*	white-tailed jackrabbit - *Lepus townsendii*
warbling vireo - *Vireo gilvus*	muskrat - *Ondatra zibethicus*
water pipit - *Anthus spinoletta*	beaver - *Castor canadensis*
western (Cordilleran) flycatcher - *Empidonax difficilis*	porcupine - *Erethizon dorsatum*
western kingbird - *Tyrannus verticalis*	gray wolf - *Canis lupus*
western meadowlark - *Sturnella neglecta*	coyote - *Canis latrans*
western tanager - *Piranga ludoviciana*	red fox - *Vulpes vulpes*
western bluebird - *Sialia mexicana*	black bear - *Ursus americanus*
western wood-pewee - *Contopus sordidulus*	grizzly bear - *Ursus arctos horribilis*
+white-breasted nuthatch - *Sitta carolinensis*	raccoon - *Procyon lotor*
white-crowned sparrow - *Zonotrichia leucophrys*	marten - *Martes americana*
white-throated sparrow - *Zonotrichia albicollis*	short-tailed weasel – ermine - *Mustela erminea*
white-throated swift - *Aeronautes saxatilis*	mink - *Mustela vison*
willow flycatcher - *Empidonax traillii*	wolverine - *Gulo luscus*
Wilson's warbler - *Wilsonia pusilla*	badger - *Taxidea taxus*
winter wren - *Troglodyte troglodytes*	striped skunk - *Mephitis mephitis*
yellow-breasted chat - *Icteria virens*	river otter - *Lutra canadensis*
yellow-headed blackbird - *Xanthocephalus*	mountain lion - *Felis concolor*
yellow warbler – *Dendroica petechia*	lynx - *Lynx canadensis*
MAMMALS	bobcat - *Lynx rufus*
northern water shrew - *Sorex palustris*	bighorn sheep - *Ovis canadensis*
Gapper's red-backed vole - *Clethrionomys gapperi*	wapiti - *Cervus elaphus*

Table 1: Faunal Resources Expected to Occur within a Ten Mile Radius of 24JF4 from Early Historic Times to the Mid-Holocene (con't)

MAMMALS (con't)	**FISHES**
mule deer - *Dama hemionus*	Yellowstone cutthroat trout - *Salmo clarki lewisi*
white-tailed deer *(Dama virginianus*	American grayling - *Thymallus arcticus*
Shiras moose *(Alces shirasi*	mountain whitefish - *Prosopium williamsoni*
pronghorn - *Antilocapra americana*	longnose sucker - *Catostomus catostomus*
modern bison - *Bison bison*	**INVERTEBRATES**
REPTILES	**Gastropods (snails)**
bull snake - *Pituophis melanoleucus*	Although several snail species occur in the study area there is no
common garter snake - *Thamnophis sirtalis*	evidence that snails were utilized by indigenous populations as a food
gopher snake - *Pituophis catenifer*	source. Further, because of the fragile nature of local gastropod shells,
prairie rattlesnake - *Crotalus viridis*	it is not suitable for tools or ornaments.
racer - *Coluber constrictor*	**Bivalves (mussels and clams):**
rubber boa - *Charina bottae*	fat pea clam - *Pisidium rotundatum*
western terrestrial garter snake - *Thamnophis elegans*	Gould - *Margaritifera falcata*
painted turtle - *Chrysemys picta*	grooved fingernail clam - *Spaerium simile*
AMPHIBIANS	Lilljeborg's pea clam - *Pisidium lilljeborgi*
long-toed salamander - *Ambystoma macrodactylum*	ridged-beak pea clam - *Pisidium compressum*
boreal (*western*) toad - *Bufo boreas*	shinny pea clam - *Pisidium nitidum*
northern leopard frog - *Rana pipiens*	short-ended pea clam - *Pisidium subtrumcatum*
spotted frog - *Rana pretiosa*	striated fingernail clam - *Spaerium striatinum*
	ubiquitous pea clam - *Pisidium casertanum*

Sources:
Burt and Grossenheider (1964);
Clarke (1981);
Gustafson (1996); Herbort (1987);
Reichel and Flath (1995);
Skaar (1996); Thompson (1982);
Weisel (1957).

Table 2: Metric, Nonmetric and Provenience Data for Folsom Projectile Points and Preforms

Record #	12	17	18	19	20	28	50
Excavation Unit	98 South Block	6S/6W		S2/W2	N2/W2	N2/W5	cutbank
Excavation Level	150-160cm BS	150-160cm BS	Surface	80-90cm BS	128cm BS	97cm BS	39cm BS
CMU	5	2	1	11	11	11	1
Lithic Material Code	YBCCS31	BCCS18	BCCS19	GBCCS10	GRCCS1	BCCS41	GBCCS18
Condition	body-base	body-base	body-base	base	base	base fragment	body-base
Preform	biface	biface	biface	indeterminate	biface	biface	biface
Type	Folsom?	Folsom	Folsom	Folsom	Folsom	Folsom	Folsom?
Flaking Pattern	parallel	parallel	parallel	indeterminate	indeterminate	parallel	parallel
Cross Section	bi-convex	concave/convex	bi-convex	concave/convex	bi-convex	indeterminate	bi-convex
Outline Symmetry	symmetrical	symmetrical	symmetrical	symmetrical	symmetrical	N/A	symmetrical
Basal Edge Shape	convex	straight	straight	concave	concave	concave	convex
Fracture Type	transverse	plunging	plunging	transverse	bending	indeterminate	transverse
Basal Height (mm)				4.68	2.29	3.50	
Basal Length (mm)	23.12			18.30	16.80		
Basal Width (mm)	22.18	17.80	23.83	21.34	19.61		39.20
Shoulder Height (mm)	56.62	41.18	38.41				55.70
Shoulder Width (mm)	27.31	26.74	29.13				41.10
Neck Width (mm)	23.40	22.73	25.79	19.60	20.27		
Neck Thickness (mm)	5.08	4.45	5.36	3.55	3.63	4.00	8.80
Maximum Body Thickness (mm)	7.16	4.53	7.01	4.28	3.63		8.80
Channel Flake Nipple Width (mm)		5.29	6.74		4.97		4.20
Channel Flake Point of Release Width (mm)		3.02	3.03		3.02		6.98
Flake Length 1 (mm)		47.90	52.71	13.72	22.71		
Flake Length 2 (mm)			31.80		18.80		
Flute Width (proximal end 1) (mm)		5.60	7.13	9.53	9.04		
Flute Width (proximal end 2) (mm)			13.60		7.80		
Flute Width (distal end 1) (mm)		19.66	20.54	10.20	11.46		
Flute Width (distal end 2) (mm)			13.90		7.60		
Body Thickness along Flute (mm)		4.45	5.61	3.73	2.85		
Number of Sides fluted		1	2	1	2		
Weight (gm)	15.10	8.60	14.65	1.70	2.65	0.90	27.50

Table 2: Metric, Nonmetric, and Provenience Data for Folsom Projectile Points and Preforms (con't)

Record #	Comments
12	Possible Folsom point preforms that broke during manufacture at the midline. Found at Folsom depth and general represents preforms #17 and #18.
17	Broke during manufacture. Did not recover tip, channel flake or debitage matching the point's MANA unit.
18	June MacHaffie found in 1947 (Forbis #1004). One side fluted similar to Clovis, opposite side where the plunging fracture occurred is fluted as Folsom.
19	Found during screening in 1951 (Forbis #1500). Only one side fluted. Did not recover tip, channel flake or debitage matching the point's MAMA unit.
20	Found in context in 1951 (Forbis #1001). Did not recover tip, channel flake or debitage matching the point's MANA unit.
28	Forbis artifact #1000. Point base fragment. Probably broke during an attempt to straighten or shape a basal "ear", or during channel flake removal.
50	Bliss and Hughes (1947) artifact #40; Smithsonian Institution National Museum of Natural History accession #206347, catalogue #406713. Presumed to be a Folsom point reform but found at the Cody level according to Bliss. Depth is approximately 20cm higher than the Cody level depth defined by Forbis (1955).

Table 3: Metric, Nonmetric and Provenience Data for Folsom Bifaces

Record #	Excavation Unit	Excavation Level	CMU	Preform	Shape	Cross-Section	Reduction Stage	Tool Condition	Retouch / Use Wear
3	2000-6	180-200cm BS	3	indeterminate	indeterminate	convex-asymmetrical	III	edge fragment	None
5	2000-4	180-200cm BS	4	flake	indeterminate	bi-plano	II	proximal-medial fragment	None
17	8S/2W	160-170cm BS	9	flake	ovate	bi-convex	II	complete	None
18	8S/2W	160-170cm BS	9	flake	ovate	bi-convex	II	complete	None
19	8S/2W	180-190cm BS	8	indeterminate	indeterminate	bi-convex	II	proximal fragment	None
20	6S/4W	170-180cm BS	8	flake	ovate	bi-convex	III	proximal-medial fragment	None
23	6S/4W	170-180cm BS	9	flake	ovate	bi-plano	II	complete	None
32	8S/2W	180-190cm BS	9	indeterminate	ovate	bi-convex	III	distal-medial fragment	None
33	8S/2W	170-180cm BS	9	flake	ovate	bi-convex	II	complete	None
35	6S/2W	180-190cm BS	9	indeterminate	ovate	bi-convex	II	proximal-medial fragment	None
38	98-South Block	180-190cm BS	5	flake	ovate	plano-convex	II	proximal-medial fragment	None
88	S1/W4	87-96cm BS	11	flake	triangular	bi-convex	II	complete	None
89	N2/W4	120cm BS	11	flake	ovoid	bi-convex	II	complete	None
90	N2/W4	134cm BS	11	flake	ovoid	bi-convex	II	complete	None
91	S1/W3	84-94cm BS	11	indeterminate	indeterminate	bi-convex	II	distal-medial fragment	None
92	N2/W8	73cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	None
93	S2/W3	82cm BS	11	indeterminate	triangular	bi-convex	III	complete	None
94	N1/W6	113cm BS	11	indeterminate	ovate	bi-convex	III	distal-medial fragment	None
95	N2/W3	149cm BS	11	indeterminate	ovate	bi-convex	III	distal-medial fragment	None
148	8S/6W	140-150cm BS	2	indeterminate	ovate	bi-convex	II	complete	None

Table 3: Metric, Nonmetric and Provenience Data for Folsom Bifaces (con't)

Record #	Retouch / Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)	COMMENTS
3	None	BBCS21		2.9	0.7	1.45	Transverse Fracture. Probably broke during manufacture.
5	None	BCCS7	4.3	5.6	1.3	53.85	Transverse Fracture. Probably broke during manufacture.
17	None	CCCS6	6.4	4.3	1.3	34.30	
18	None	BCCS41	9.4	5.7	2.46	138.00	
19	None	BCCS41	1.5	3.6	1.2	5.35	Transverse Fracture. Probably broke during manufacture. The pieces included with the Knapping Feature 2.
20	None	YBCCS23	6.2	5.3	1.0	45.65	Transverse Fracture. Probably broke during manufacture.
23	None	YBCCS52	9.0	4.4	2.5	41.35	Possible Folsom Point preform.
32	None	RCCS26	3.7	5.2	0.9	24.70	Transverse Fracture. Probably broke during manufacture.
33	None	RCCS31	5.1	3.1	0.9	20.00	
35	None	RCCS48	3.5	6.4	1.3	45.35	Transverse Fracture. Probably broke during manufacture.
38	None	YBCCS24	4.4	4.2	1.0	25.60	Transverse Fracture. Probably broke during manufacture.
88	None	YBCCS33a	5.5	7.6	1.7	62.28	Forbis artifact #5000. Made on a broad flake that terminated in a hinge fracture. Large edge retouched on interior surface.
89	None	BBCS29	9.7	5.8	2.4	147.00	Forbis artifact #4003.
90	None	BCCS29	6.9	5.8	1.5	65.63	Forbis artifact #3002.
91	None	YBCCS9	3.0	3.7	1.0	15.30	Forbis artifact #3005.
92	None	YBCCS1d		4.8	1.2	31.96	Forbis artifact #3007.
93	None	YBCCS22	6.3	3.4	0.95	21.82	Forbis artifact #1002.
94	None	YBCCS51		4.2	1.3	43.74	Forbis artifact #3000.
95	None	SDQZT2f		3.4	0.88	17.92	Forbis artifact #3006.
148	None	BCCS41	7.9	3.8	1.5	46.73	Associated with Knapping Feature 4. Probably intended as a Folsom point preform. Discarded because of a natural internal fracture and a material flaw at one lateral edge.

Table 4: Metric, Nonmetric and Provenience Data for Folsom Cores

Record #	Excavation Unit	Excavation Level	CMU	Preform	Core Shape	Shape	Extent of Utilization	Condition	Retouch/Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
1	4N/8E	180-190cm BS	2	block	unprepared	blocky	minimal	complete	None	GRAN5	4.5	6.5	4.0	85.0
5	4N/8E	180-190cm BS	2	pebble	bipolar	pebble	moderate	complete	None	YBCCS28	4.4	4.0	3.4	64.85
12	2000-6	180-200cm BS	3	pebble	bipolar	amorphous	minimal	complete	None	BCCS16	3.6	2.2	1.5	13.15
13	2000-6	180-200cm BS	3	indetermined	unprepared	amorphous	extensive	complete	None	CCCS6	5.6	2.0	1.5	18.6
14	C-7	160-180cm BS	3	indetermined	unprepared	amorphous	extensive	complete	None	RCCS248	7.8	0.6	3.4	139.5
15	C-7	160-180cm BS	3	indetermined	unprepared	amorphous	extensive	complete	None	BCCS41	6.5	4.0	2.6	137.7
16a-16c	C-5	180-200cm BS	3	indetermined	unprepared	amorphous	extensive	fragment	None	BCCS41	4.2	4.4	3.4	232.8
17	C-4	180-200cm BS	3	indetermined	unprepared	amorphous	extensive	complete	None	BCCS21	4.3	7.2	2.7	37.75
18	C-2	180-200cm BS	3	small nodule	unprepared	amorphous	minimal	complete	None	BCCS21	8.5	6.3	5.5	172.1
18	C-2	160-180cm BS	3	indetermined	unprepared	amorphous	extensive	fragment	None	BCCS44	6.7	3.5	2.5	61.9
20	C-2	180-200cm BS	3	small cobble	unprepared	amorphous	moderate	fragment	None	BCCS33	3.5	5.0	2.5	76.5
21	C-1	180-200cm BS	3	indetermined	unprepared	amorphous	extensive	complete	None	BCCS3445	7.0	7.2	3.0	147.3
22	C-1	180-200cm BS	3	indetermined	bifacial	tabular	extensive	complete	None	BCCS45	13.3	6.7	2.8	255.14
29	2000-4	160-180cm BS	4	indetermined	unprepared	amorphous	extensive	fragment	None	YBCCS1d	4.5	5.5	2.0	43.85
31	2000-A	160-180cm BS	4	small nodule	unprepared	amorphous	minimal	complete	None	BCCS28	5.6	3.1	2.5	46.0
39	2000-B	180-200cm BS	4	pebble	bipolar	pebble	minimal	complete	None	BCCS21	4.2	3.3	2.0	31.85
45	2000-C	160-180cm BS	4	flake	unprepared	amorphous	moderate	complete	None	BCCS29	12.6	9.2	4.0	290.0
46	2000-D	160-180cm BS	4	flake	bifacial	ovate	moderate	complete	None	BCCS41	7.5	5.2	2.0	82.0
56	98-South Block	180-190cm BS	5	indetermined	unprepared	amorphous	extensive	complete	None	BCCS9	8.95	7.3	3.86	263.0
57	8S/4W	170-180cm BS	8	small nodule	unprepared	blocky	moderate	complete	None	BCCS44	7.22	5.87	3.86	213.0
58	8S/4W	190-200cm BS	8	small nodule	unprepared	blocky	moderate	complete	None	BCCS9	7.06	4.9	2.8	95.1
59	6S/4W	170-180cm BS	8	indetermined	unprepared	amorphous	minimal	indetermined	None	BCCS44	5.6	6.5	2.2	95.65
60	6S/4W	170-180cm BS	8	small nodule	bifacial	ovate	moderate	complete	None	BCCS44	8.3	6.4	3.1	174.0
72	98-South Block	190-200cm BS	5	med nodule	unprepared	amorphous	extensive	complete	None	BCCS41	9.0	7.0	5.5	418.0
73	4S/0E	180-190cm BS	10	med nodule	unprepared	amorphous	extensive	complete	None	BCCS9	8.0	6.6	1.9	168.0
75	0N/0E	180-190cm BS	10	indetermined	unprepared	amorphous	extensive	complete	None	YBCCS52	5.7	4.5	2.6	51.45
78	S1/W3	out-of-context	1	indetermined	unprepared	amorphous	extensive	complete	None	BCCS29	10.5	6.4	4.6	259.0
79	N2/W3	139cm	11	indetermined	unprepared	blocky	extensive	complete	None	BCCS41	5.3	4.1	2.6	72.16
80	S1/W6	107-123cm	11	indetermined	unprepared	ovoid	extensive	complete	None	BCCS41	6.1	4.5	2.6	73.0
81	N1/W4	119cm	11	indetermined	unprepared	ovoid	extensive	complete	None	BCCS41	8.1	5.7	3.6	1127.0
82	S1/W5	119cm	11	indetermined	unprepared	amorphous	extensive	complete	None	BCCS41	8.8	6.6	3.5	189.0
96	N2/W6	105-120cm	11	nodule	unprepared	blocky	moderate	complete	None	BCCS33	6.2	6.0	3.5	200.0

Table 4: Metric, Nonmetric and Provenience Data for Folsom Cores (con't)

Record #	Comments
1	SW quadrant (1m x 1m subdivision)
5	SW quadrant (1m x 1m subdivision); tested pebble of moderate quality.
12	Small bipolar core, not suitable for free-hand reduction work. Exhibits desire to produce small (short and thin) and
13	Exhausted flake core. Probably free-hand reduction core, but currently too small to be useful for such work.
14	Free-hand percussion core
15	Free-hand percussion core
16a-16c	Possible core fragments of similar size associated with Knapping Feature 1. Core fragments included with the Knapping Feature 1 debitage baggies.
17	Exhausted core.
18	Very poor quality piece. Heavily intermixed with limestone. Only small areas of tool quality chert available. A few small flakes randomly removed from the tool quality zones.
19	Still useable piece. Many small, straight flakes randomly removed from the core.
20	Four fragments from a small chert cobble. Lithic material is atypical for local chert varieties and may have been imported from elsewhere. One side of core is almost polyhedral in form.
21	Final series of flakes removed (2cm W x 3cm L) not large enough for medium or large points.
22	Still useable piece. Final series of randomly removed flakes were small (SG2) and straight.
29	Still useable piece. Many small, straight flakes randomly removed from the core. Cortex on one short surface/edge.
31	Very small minimally worked core exhibiting 3 overlapping bladelet-like flake removal scars on the one clean surface. Remainder of core is covered in cortex. The piece could only be reduced to any degrees through bipolar reduction.
39	Cortex covers exterior surface.
45	Random flake removals from around the perimeter of piece.
46	Random flake removal from both faces.
56	Some cortex on one surface.
57	Cortex covers most of one face and one end.
58	Cortex covers most of one side.
59	Some cortex (discontiguous) on one surface.
60	Best described as a Stage I biface. Some cortex on both faces.
72	Discontinuous cortex around perimeter.
73	Some cortex on exterior surface.
75	Marginal quality chert.
78	Forbis artifact #4005. Assigned by Forbis to Folsom based on material type.
79	Forbis artifact #4001.
80	Forbis artifact #4004.
81	Forbis artifact #4002.
82	Forbis artifact #4000.
90	Opportunistic flake core.

Table 5: Metric, Nonmetric and Provenience Data for Folsom DEF/M

Record #	5	6	29	30	31	32
Excavation Unit	C-9	C-5	N2/W6	S1/W1	N2/W5	N2/W6
Excavation Level	160-180cm BS	160-180cm BS	107-123cm BS	85cm BS	107cm BS	116cm BS
CMU	3	3	11	11	11	11
Debitage Type	flake	flake	flake	flake	flake	flake
Reduction Stage	secondary	secondary	secondary	secondary	secondary	secondary
Exterior Surface Flake Scar Count	1	2	4	3	3	4
Flake Scar Orientation		intersecting	intersecting	intersecting	intersecting	intersecting
Lithic Material	BCCS41	RHY2	RCCS2	RCCS2	YBCCS3	BCCS9
Flake Shape	elongate	ovate	ovate	elongate	ovate	indeterminate
Flake Condition	complete	broken	complete	complete	fragment	fragment
Flake Termination Type	feather	feather	feather	feather	feather	feather
Platform Type	point	faceted	flat	flat	indeterminate	indeterminate
Flake Type	shaping/thinning	biface thinning	shaping/thinning	shaping/thinning	shaping/thinning	shaping/thinning
Edge Modification	unifacial	bifacial flaking	bifacial flaking	unifacial flaking	unifacial flaking	alt unifacial flaking
Number of Retouched Edges	1	2	1	1	1	2
Size-Grade	3	1	1	1	2	1
Max Length (cm)	2.4	4.4	3.5	10.4	2.6	4.7
Max Width (cm)	1.3	4.1	6.8	4.4	5.5	5.8
Max Thickness (cm)	.7	.7	1.3	1.3	.97	.96
Weight (gm)	1.4	18.15	35.09	76.28	13.38	25.08

Record #	Comments
5	Shallow, but continuous and well-defined flake removals from exterior surface of one lateral edge.
6	Shallow and somewhat erratic flake removals from entirety of both lateral edges.
29	Forbis artifact #3001. Bifacial flaking of short segment of one lateral edge.
30	Forbis artifact #2002. Shallow, unifacial flaking along a short segment of exterior surface of one lateral margin.
31	Forbis artifact #3003. Patterned, intentional, unifacial flaking along exterior surface of one lateral margin. Piece was shaped into a drop point knife style pattern.
32	Forbis artifact #3004. Patterned, intentional, unifacial flaking along exterior surface of one lateral margin and interior surface of opposite lateral margin.

Table 6: Flake Platform Morphology among Folsom Unmodified Debitage

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
AND2	1					1
BAS1	1					1
BCCS1						0
BCCS2						0
BCCS3		1	1			2
BCCS4	5		2			7
BCCS5	1					1
BCCS6	2					2
BCCS7	1		1			2
BCCS9	9		12	2		23
BCCS11						0
BCCS12	1		3			4
BCCS16						0
BCCS18	1			1		2
BCCS19	1	1				2
BCCS21	7		8	1		16
BCCS23		2	2			4
BCCS24	1					1
BCCS25	1					1
BCCS26	1					1
BCCS28	11		3	1		15
BCCS29	1		5			6
BCCS32	1					1
BCCS36	1					1
BCCS38	2	1	2	1		6
BCCS41	50	28	109	9		196
BCCS42			1			1
BCCS43	1					1
BCCS44	1					1
BCCS46	1	1		1		3
BCCS47	1					1
BPCCS5	2		2			4
CCCS1			1			1
CCCS2	4	1	3			8
CCCS3	6	2	14	2		24
CCCS5	10	8	1	1		20
CCCS6	9	7	2	1		19
CCCS7	3	1	10			14
CCCS8	1					1
CCCS9	1	1				2
GBCCS3	1					1
GBCCS10	2		1			3
GBCCS11						0

Table 6: Flake Platform Morphology among Folsom Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
GBCCS13				1		1
GBCCS17	1					1
GBCCS18	8	9	2	2		21
GBCCS20	5	1	1			7
GBCCS21			1			1
GBCCS36		1				1
GBCCS39		1	1			2
GBCCS43			1			1
GRAN3	2					2
GRAN5	26		10	1		37
QTZCRY2						0
RCCS2	1		7			8
RCCS3	1		1			2
RCCS4			5			5
RCCS5			1			1
RCCS6	4	2	5			11
RCCS8						0
RCCS11	1	1	2			4
RCCS12	3		3	1		7
RCCS13			5			5
RCCS15						0
RCCS16						0
RCCS19	2		6	1		9
RCCS20			1			1
RCCS22	1		5			6
RCCS26	1		2			3
RCCS27			1			1
RCCS28	1					1
RCCS30	1					1
RCCS32			2			2
RCCS33	1					1
RCCS35		1	1			2
RCCS47	1		2			3
RCCS48	11	6	21	5		43
RCCS56	1	1				2
SDQZT4m	1					1
SDQZT5j	1		1			2
SLM1			1			1
WCCS3	1					1
WCCS4						0
WCCS5	2		4			6
WCCS10	1					1
WCCS11						0
WCCS12	1		1			2
WCCS14	1	2				3
WCCS15	1					1
YBCCS1a	1		2	1		4
YBCCS1b			1	1		2
YBCCS1d	2		1	1		4

Table 6: Flake Platform Morphology among Folsom Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
YBCCS2						0
YBCCS3			1			1
YBCCS4	3		4	1		8
YBCCS5		1				1
YBCCS7	1					1
YBCCS8			1			1
YBCCS9	1	1				2
YBCCS11		1	2			3
YBCCS12		1	1			2
YBCCS15	1		1			2
YBCCS18	1		2			3
YBCCS19	1					1
YBCCS21						0
YBCCS22			2			2
YBCCS23	1		3			4
YBCCS24		1				1
YBCCS25			1			1
YBCCS27	1					1
YBCCS28	2	1	2			5
YBCCS29						0
YBCCS30	3		8			11
YBCCS31	1					1
YBCCS33a						0
YBCCS35	1		1			2
YBCCS37	1	1				2
YBCCS39	1					1
YBCCS40	1		1			2
YBCCS42	2					2
YBCCS43		1				1
YBCCS45	1		2	1		4
YBCCS49	1					1
YBCCS50	5		1			6
YBCCS51	1		3	1		5
YBCCS52	4		2			6
YBCCS54			1			1
YBCCS55	1		4			5
TOTAL	**261**	**87**	**323**	**37**	**0**	**708**

Table 7: Size-Grade and Weights for Folsom Unmodified Debitage

MANA Designation	SIZE-GRADE and WEIGHT										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
AND2	1	7.69									1	7.69
BAS1	1	35.05									1	35.05
BCCS1					2	2.65					2	2.65
BCCS2					1	0.35					1	0.35
BCCS3			2	6.85							2	6.85
BCCS4			3	19.45	8	4.6					11	24.05
BCCS5	1	17.82									1	17.82
BCCS6			2	12.78							2	12.78
BCCS7			2	15.35	5	2.15					7	17.5
BCCS9	3	46.93	10	54.03	15	8.73					28	109.69
BCCS11					2	2.8					2	2.8
BCCS12			2	17.4	3	1.55					5	18.95
BCCS16			1	4.92							1	4.92
BCCS18	2	64.44			1	0.55					3	64.99
BCCS19			3	26.05							3	26.05
BCCS21	3	77.35	4	16.9	12	6.4	1	0.15			20	100.8
BCCS23			1	8.05	5	2.21					6	10.26
BCCS24					1	0.7					1	0.7
BCCS25			6	34.45							6	34.45
BCCS26	1	18.2									1	18.2
BCCS28	1	10.1	6	30.15	10	6.8					17	47.05
BCCS29			2	2.81	4	0.85					6	3.66
BCCS32	2	45.99									2	45.99
BCCS36					1	0.75					1	0.75
BCCS38	2	11.76	2	10.19	7	4.2					11	26.15
BCCS41	19	474.25	79	222.54	157	75.5	38	3.8			293	776.09
BCCS42					1	0.35					1	0.35
BCCS43					1	1.6					1	1.6
BCCS44			2	16.9	1	2.15					3	19.05
BCCS46	2	80.48	2	18.55	1	0.65					5	99.68
BCCS47			1	4.5							1	4.5
BPCCS5			3	3.3	6	1.8					9	5.1
CCCS1					3	1.65	1	0.1			4	1.75
CCCS2	2	55.15	2	5.48	10	6.15	1	0.15			15	66.93
CCCS3	1	17.8	9	46.7	21	10.67					31	75.17
CCCS5	6	69.7	17	60.91	9	4.93					32	135.54
CCCS6	5	204.38	14	43.81	9	8.67					28	256.86
CCCS7			6	22.25	11	8.55	1	0.05			18	30.85
CCCS8					1	1.4					1	1.4
CCCS9			4	26.15							4	26.15
GBCCS3			1	1.1							1	1.1
GBCCS10			3	22.85	1	2.0					4	24.85
GBCCS11					2	0.8					2	0.8
GBCCS13			1	7.35							1	7.35
GBCCS17	1	14.15									1	14.15
GBCCS18	11	260.56	5	18.25	8	4.63					24	283.44
GBCCS20	3	103.89	4	15.72							7	119.61

Table 7: Size Grade and Weights for Folsom Unmodified Debitage (con't)

MANA Designation	SIZE GRADE and WEIGHT										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
GBCCS18	11	260.56	5	18.25	8	4.63					24	283.44
GBCCS20	3	103.89	4	15.72							7	119.61
GBCCS21					1	1.55					1	1.55
GBCCS36			1	2.2							1	2.2
GBCCS39			1	1.4	1	0.6	2	0.25			4	2.25
GBCCS43					1	0.2					1	0.2
GRAN3			2	3.79							2	3.79
GRAN5	17	595.71	29	204.88	24	23.04	9	0.7			79	824.33
QTZCRY2			1	1.85							1	1.85
RCCS2			5	9.49	10	5.7					15	15.19
RCCS3					4	2.15					4	2.15
RCCS4			2	7.92	7	1.83	4	0.3			13	10.05
RCCS5			1	3.3	1	2.1	2	0.3			4	5.7
RCCS6	1	47.69	3	13.7	24	10.25	2	0.3			30	71.94
RCCS8			1	1.1							1	1.1
RCCS11			1	2.9	8	4.5	2	0.25			11	7.65
RCCS12			3	21.95	8	2.15	3	0.35			14	24.45
RCCS13					5	2.3					5	2.3
RCCS15					1	0.2					1	0.2
RCCS16							1	0.05			1	0.05
RCCS19	1	19.3	2	4.31	8	3.5	6	0.55			17	27.66
RCCS20			1	14.12							1	14.12
RCCS22			3	4.1	5	2.25					8	6.35
RCCS26			1	8.57	3	0.77	2	0.2			6	9.54
RCCS27			1	0.65							1	0.65
RCCS28					1	0.65					1	0.65
RCCS30			1	2.68							1	2.68
RCCS32			3	13.17	2	1.15					5	14.32
RCCS33			1	6.3	1	1.13					2	7.43
RCCS35	1	8.42			1	1.35					2	9.77
RCCS47			2	3.4	3	1.05					5	4.45
RCCS48	6	120.46	18	42.8	39	28.33	3	0.15			66	191.74
RCCS56					1	0.25					1	0.25
SDQZT4m					1	1.35					1	1.35
SDQZT5j			1	3.1	1	1.9					2	5
SLM1			1	2.05							1	2.05
WCCS3					1	1.05	1	0.2			2	1.25
WCCS4			3	5.85							3	5.85
WCCS5			4	5.78	3	0.8					7	6.58
WCCS10			1	2.25							1	2.25
WCCS11					2	0.4					2	0.4
WCCS12			1	8.6	1	0.15					2	8.75
WCCS14			3	7.25							3	7.25
WCCS15					1	0.4					1	0.4
YBCCS1a			3	14.47	2	1.2					5	15.67

Table 7: Size Grade and Weights for Folsom Unmodified Debitage (con't)

MANA Designation	SIZE GRADE and WEIGHT										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
YBCCS1b			3	11.2	1	0.1					4	11.3
YBCCS1d			3	11.2	1	0.25					4	11.45
YBCCS2			1	7.9							1	7.9
YBCCS3							1	0.2			1	0.2
YBCCS4	3	107.73	1	1.55	4	1.5					8	110.96
YBCCS5					1	1.01					1	1.01
YBCCS7	1	33.66									1	33.66
YBCCS8					1	0.3					1	0.3
YBCCS9	2	56.5	1	7.8	1	1.0					4	65.3
YBCCS11			1	1.5	2	1.5					3	3
YBCCS12					2	1.75					2	1.75
YBCCS15					2	0.9					2	0.9
YBCCS18	4	225.55	3	43.09	4	1.55					11	270.19
YBCCS19					1	2.05					1	2.05
YBCCS21					1	0.15					1	0.15
YBCCS22					2	0.35					2	0.35
YBCCS23	1	30.83	3	6.13	2	0.45					6	37.41
YBCCS24			1	3.55							1	3.55
YBCCS25							1	0.1			1	0.1
YBCCS27	1	31.32			2	0.2					3	31.52
YBCCS28			2	10.79	3	1.55					5	12.34
YBCCS29					1	0.25					1	0.25
YBCCS30	1	8.5	1	2.2	6	3.4	6	0.4			14	14.5
YBCCS31	1	11.5	1	1.0	1	0.6					3	13.1
YBCCS33a					1	0.65					1	0.65
YBCCS35			4	12.4							4	12.4
YBCCS37					2	0.7					2	0.7
YBCCS39			2	7.25							2	7.25
YBCCS40	1	17.15			1	0.35	1	0.1			3	17.6
YBCCS42			2	4.85							2	4.85
YBCCS43			1	6.45	1	0.5					2	6.95
YBCCS45	1	7.87	3	14.03	3	2.42					7	24.32
YBCCS49	1	11.0									1	11
YBCCS50			3	41.4	3	2.13					6	43.53
YBCCS51			1	3.27	4	2.85					5	6.12
YBCCS52	4	176.25	1	7.95	5	11.16					10	195.36
YBCCS54					1	1.01					1	1.01
YBCCS55			1	1.65	4	3.0	1	0.1			6	4.75
TOTAL	**114**	**3,125.13**	**338**	**1,426.83**	**553**	**324.87**	**89**	**8.55**	**0**	**0**	**1,094**	**4,885.38**

Table 8: Morphology by Size-Grade of Folsom Unmodified Debitage

Size-Grade	Complete Flakes	Broken Flake	Flake Fragments	Shatter	COUNT
1	83	7	11	13	114
2	220	17	42	59	338
3	316	16	86	136	554
4	47	1	11	29	88
5	0	0	0	0	0
TOTAL	**666**	**41**	**150**	**237**	**1,094**

Table 9: Folsom Component MANA Units and Associated Artifacts

MANA Designation	Projectile Point/Preform	Hammerstone	Graver	Endscraper	Biface	Core	DEF/M	Debitage
AND2								1
BAS1								1
BCCS1								2
BCCS2								1
BCCS3								2
BCCS4								11
BCCS5								1
BCCS6								2
BCCS7					1			7
BCCS9						3		28
BCCS11								2
BCCS12								5
BCCS16						1		1
BCCS18	1							3
BCCS19	1							3
BCCS21					1	3		20
BCCS23								6
BCCS24								1
BCCS25								6
BCCS26								1
BCCS28						1		17
BCCS29					2	2	1	6
BCCS32								2
BCCS33						2		0
BCCS36								1
BCCS38								11
BCCS41	1				3	8	2*	4,179+
BCCS42								1
BCCS43								1
BCCS44						1	3	3
BCCS45						2		0
BCCS46								5
BCCS47								1
BPCCS5								9
CCCS1								4
CCCS2								15
CCCS3			1					31
CCCS5								32

Table 9: Folsom Component MANA units and associated artifacts (con't)

MANA Designation	Projectile Point/Preform	Hammerstone	Graver	Endscraper	Biface	Core	DEF/M	Debitage
CCCS6					1	1		28
CCCS7								18
CCCS8								1
CCCS9								4
GBCCS3								1
GBCCS10	1							4
GBCCS11								2
GBCCS13								1
GBCCS17								1
GBCCS18	1							24
GBCCS20								7
GBCCS21								1
GBCCS36								1
GBCCS39								0
GBCCS43								2
GRCCS1	1					1		79
GRAN3								1
GRAN5		2					2	15
QTZCRY2								4
RCCS2								13
RCCS3								4
RCCS4								30
RCCS5								1
RCCS6								11
RCCS8								14
RCCS11								5
RCCS12								1
RCCS13								1
RCCS15								17
RCCS16								1
RCCS19								8
RCCS20					1			6
RCCS22								1
RCCS26								1
RCCS27								1
RCCS28					1			0
RCCS30								5
RCCS31								2
RCCS32								2
RCCS33								5
RCCS35					1	1		66
RCCS47								1
RCCS48							1	0
RCCS56					1			0
RHY2								1
SDQZT2f								2
SDQZT4m								1
SDQZT5j								2
SLM1								3

Table 9: Folsom Component MANA units and associated artifacts (con't)

MANA Designation	Projectile Point/Preform	Hammerstone	Graver	Endscraper	Biface	Core	DEF/M	Debitage
WCCS3								7
WCCS4								1
WCCS5								2
WCCS10								2
WCCS11								3
WCCS12								1
WCCS14								5
WCCS15								4
YBCCS1a					1	1		4
YBCCS1b								1
YBCCS1d							1	1
YBCCS2								1
YBCCS3								0
YBCCS4								8
YBCCS5								1
YBCCS7								1
YBCCS8								1
YBCCS9					1			4
YBCCS11								3
YBCCS12								2
YBCCS15								2
YBCCS18								11
YBCCS19								1
YBCCS21								1
YBCCS22					1			2
YBCCS23					1			6
YBCCS24					1			1
YBCCS25								1
YBCCS27								3
YBCCS28						1		5
YBCCS29								1
YBCCS30								14
YBCCS31	1							3
YBCCS33a					1			1
YBCCS35								4
YBCCS37								2
YBCCS39								2
YBCCS40								3
YBCCS42								2
YBCCS43								2
YBCCS45								7
YBCCS49								1
YBCCS50								6
YBCCS51					1			5
YBCCS52					1	1		10
YBCCS54								1
YBCCS55								6

*includes notched flake of Knapping Feature 1; +includes Knapping Features 1, 2, and 4 debitage; FCR not included in the above counts.

Table 10: Metric, Nonmetric and Provenience Data for Cody Projectile Points

Description	Record #									
	13	21	22	23	24	25	26	29	30	31
Excavation Unit	98 South Block	S1/W3	S1/W2	S1/W4	S1/W3		S1/W4		S1/S4	S1/W4
Excavation Level Depth	18	5	6	5	5	0	5		4	4
Excavation Level Depth	170-180cm BS	72cm BS	79cm BS	73cm BS	64cm BS	surface	73cm BS	surface	58cm BS	58cm BS
CMU	5	11	11	11	11	1	11	1	11	11
Lithic Material Code	BCCS27	BCCS38	DAC1	YBCCS30	YBCC54	CCCS2	YBCCS4			
Condition	body-tip	base	complete	complete	complete	base	base	complete	complete	complete
Preform	biface	biface	biface	biface	biface	biface	biface	biface	biface	biface
Type	indeterminate	Scottsbluff	Eden	Scottsbluff	Eden	Scottsbluff	Scottsbluff	AB/Nezu Knife?	Scottsbluff	Scottsbluff
Flaking Pattern	double diagonal	parallel	parallel	parallel	parallel	parallel	parallel	parallel	parallel	parallel
Cross-Section	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex	bi-convex
Outline Symmetry	symmetrical	N/A	symmetrical	symmetrical	symmetrical	N/A	symmetrical	symmetrical	symmetrical	symmetrical
Basal Edge Shape		straight	straight	straight	straight	straight	straight	straight	straight	straight
Fracture Type	transverse	transverse	N/A	N/A	N/A	transverse	transverse	N/A	N/A	N/A
Base Height (mm)			21.30	15.83	15.35			14.80	18.60	16.00
Base Width (mm)		17.23	19.42	18.67	18.91	18.22	19.00	25.00	18.20	18.00
Shoulder Height (mm)			21.45	15.97	17.51			14.30	19.00	20.20
Shoulder Width (mm)			21.93	21.67	19.28			28.00	23.00	24.40
Neck Width (mm)			21.35	19.27	18.54			23.50	19.80	20.80
Neck Thickness (mm)		3.95	5.51	4.48	5.85	4.50	4.00			
Body Length (mm)			41.86	31.21	26.14			33.00	36.00	40.00
Max Body Thickness (mm)	6.29		4.70	6.92	5.56					
Max Length (mm)			62.24	46.65	42.33			48.00	56.00	56.00
Hafted Retouch Index				0.937	0.625			0.50	0.69	0.94
Weight (gm)	2.80	1.26	8.20	6.84	5.23	1.68	1.19	0.00	0.00	0.00

Table 10: Metric, Nonmetric and Provenience Data for Cody Projectile Points

Record #	Comments
13	Recovered from 180cm BS (sub-Scottsbluff Component as defined by Davis). Probably broke during manufacture.
21	Forbis artifact #1204. Basal edges are lightly ground.
22	Forbis artifact #1203. Basal edges are lightly ground.
23	Forbis artifact #1200. Basal edges are lightly ground.
24	Forbis artifact #1209. Basal edges are lightly ground.
25	Forbis artifact #1735. Basal edges are lightly ground.
26	Forbis artifact #1207. Basal edges are lightly ground.
29	Forbis artifact #1212. Found by Edmund MacHaffie. Artifact is missing from UM collection. A scaled photographic image was used for metric observations.
30	Forbis artifact #1201. Artifact is missing from UM collection. A scaled photographic image was used for metric observations.
31	Forbis artifact #1202. Artifact is missing from UM collection. A scaled photographic image was used for metric observations.

Table 11: Metric, Nonmetric and Provenience Data for Cody Non-Hafted Bifaces

Record #	Excavation Unit	Excavation Level	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch / Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
4	C-5	160-180cm	3	indeter	elongate	bi-convex	III	complete	None	GBCCS1	10.0	5.0	1.7	72.8
9	2000-B	80-100cm BS	4	flake	ovate	plano-convex	III	complete	None	GBCCS1	8.0	5.5	1.7	91.8
16	96 West Test	110-120cm BS	6	flake	ovate	plano-convex	III	complete	None	GBCCS2	7.7	4.2	1.4	53.9
21	2008-SB2	150-160cm	3	indeter	ovate	bi-convex	III	dist frag	None	YBCCS7	2.3	4.1	0.6	7.70
27	2008-SB2	130-140cm	3	flake	ovate	bi-convex	II	prox-med frag	None	BCCS19	2.6	4.5	1.3	13.1
48	98 South Block	130-140cm	5	indeter	indeter	bi-convex	III	indeter frag	None	BCCS123	3.0	3.5	1.2	11.50
51	98 South Block	14-150cm BS	5	flake	ovate	bi-convex	III	dist-med frag	None	BCCS31	1.9	2.8	0.4	2.75
64	N1/W4	79cm BS	11	flake	triangular	bi-convex	III	complete	None	BCCS2	6.8	3.3	0.87	20.6
65	S1/W5	72cm BS	11	indeter	triangular	bi-convex	III	complete	None	BCCS23	8.5	3.8	0.92	35.7
66	N2/W4	84cm BS	11	indeter	triangular	bi-convex	III	complete	None	CCCS5	8.4	5.0	1.5	64.4
67	S1/W4	73cm BS	11	flake	ovoid	bi-convex	III	complete	None	CCCS1	6.8	3.5	0.97	25.2
68	N1/W5	79cm BS	11	indeter	ovoid	bi-convex	III	complete	None	GBCCS1	12.8	3.1	0.97	47.1
69	N1/W2	82cm BS	11	flake	ovoid	plano-convex	II	complete	None	GBCCS1	7.9	4.2	1.3	38.5
70	S1/W5	64cm BS	11	indeter	rectangula	bi-convex	III	complete	None	CCCS19	11.3	4.3	1.2	63.2
71	N2/W4	93cm BS	11	indeter	triangular	bi-convex	III	complete	None	CCCS7	5.9	3.1	0.91	17.4
72	S1/W2	70cm BS	11	indeter	ovoid	bi-convex	II	prox frag	None	CCCS7		7.2	1.5	37.8
73	N1/W5	73cm BS	11	flake	ovoid	bi-convex	II	complete	None	CCCS3	6.1	3.8	1.2	28.1
74	S1/W3	73cm BS	11	indeter	indeter	bi-convex	III	dist-med frag	None	CCCS7		3.5	0.94	9.32
75	N1/W5	73cm BS	11	indeter	ovoid	bi-convex	II	complete	None	GBCCS1	7.7	4.7	1.8	72.5
76	S1/W4	73cm BS	11	indeter	indeter	bi-convex	III	dist-med frag	None	CCCS7	5.7	4.4	1.2	34.7
77	N2/W5		1	indeter	ovoid	bi-convex	II	complete	None	GBCCS1	9.2	4.6	1.5	64.3
78	N2/W3	88cm BS	11	indeter	indeter	bi-convex	II	dist frag	None	CCCS2		3.5	1.2	10.0
79	S1/W4	67cm BS	11	indeter	ovoid	bi-convex	II	complete	None	GBCCS1	7.3	4.5	1.8	46.3
80	S1/W3	79cm BS	11	indeter	ovoid	bi-convex	II	prox-med frag	None	GBCCS1		4.5	1.3	36.5
81	N1/W2	90cm BS	11	indeter	ovoid	bi-convex	II	complete	None	YBCCS3	12.1	6.6	3.2	274.
82		surface	1	flake	ovoid	bi-convex	II	dist-med frag	None	CCCS7		4.2	1.9	24.8
83	N1/W3	74cm BS	11	flake	ovoid	bi-plano	I	complete	None	CCCS1	5.8	2.9	1.1	18.4
84	N2/W2	67cm BS	11	flake	indeter	bi-convex	II	prox-med frag	None	CCCS7		3.1	1.0	12.2
85	N2/W2	75cm BS	11	indeter	indeter	bi-convex	II	medial frag	None	YBCCCS		3.7	0.75	7.58
86	N1/W4	82cm BS	11	flake	ovoid	bi-convex	II	complete	None	CCCS2	6.7	4.3	1.4	35.9
87	S1/W5	70cm BS	11	flake	indeter	bi-convex	II	indeter frag	None	GBCCS1		3.2	0.64	7.21
100	S2/W2	60-82cm BS	11	flake	amorphou	irregular	II	complete	None	OBS1	2.3	3.8	1.1	8.60
145	S2/W3	60-75cm BS	11	indeter	indeter	bi-convex	II	dist frag	None	GBCCS1		5.9	1.4	22.8
147	S1/W4	70cm BS	11	flake	ovoid	bi-convex	III	complete	None	RCCS20	4.9	3.1	0.89	17.4

indeter - indeterminate; dist - distal; prox. - proximal; med – medial; frag – fragment.

Table 11: Metric, Nonmetric and Provenience Data for Cody Non-Hafted Bifaces

Record #	Comments
4	Possible transverse fracture at proximal end, but considered here to be complete.
9	
16	
21	Bending fracture. Probably broke during manufacture.
27	Transverse fracture. Probably broke during manufacture.
48	Fractured along two intersecting 90° planes.
51	Transverse fracture. Probably broke during manufacture.
64	Forbis artifact #1210. Probably a Cody point preform.
65	Forbis artifact #1206. Probably a Cody point preform.
66	Forbis artifact #3217. Probably a Cody point preform.
67	Forbis artifact #3220. Both faces heavily sun-bleached. Found in 2 pieces during excavation, but rejoined. Transverse fracture probably broke during manufacture.
68	Forbis artifact #1208A - 1208E. Found in 5 pieces across 3 excavation units at largely the same depth. Very challenging biface to make.
69	Forbis artifact #3210. Probably a Cody point preform. Irregularities on one face would have discouraged further refinement.
70	Forbis artifact #3201. Two pieces conjoined by Forbis, do not appear to be from same artifact.
71	Forbis artifact #1211.
72	Forbis artifact #3218.
73	Forbis artifact #3213.
74	Forbis artifact #3219.
75	Forbis artifact #3209 and #6016. Found in 2 pieces now conjoined, Transverse fracture broke the original biface.
76	Forbis artifact #3207. Found by Edmund MacHaffie in cutbank profile.
77	Forbis artifact #10007. Carling Malouf find, unknown date. Depth of artifact unknow, only the excavation unit listed in notes. Eith Forbis or Malouf placed this biface with the Cody Component for unknown reasons.
78	Forbis artifact #3215.
79	Forbis artifact #3216.
80	Forbis artifact #3200.
81	Forbis artifact #4202.
82	Forbis artifact #3202. Found by Edmund MacHaffie. Forbis placed the artifact with the Cody Component for unknown reasons.
83	Forbis artifact #3208.
84	Forbis artifact #3204.
85	
86	Forbis artifact #3221.
87	Forbis artifact #3205.
100	Forbis artifact #6005 (12-425, K2185); XRF Sample #O-14. Misidentified by Knudson as a graver. The projection is incidental. It is minimally bifacially pressure flaked, thick, broken flake.
145	Knudson artifact #6010. One surface is heavily sun-bleached or weathered.
147	Forbis artifact #3212. Found in cutbank by Edmund MacHaffie. Probably a medium sized projectile point preform.

Table 12: Metric, Nonmetric and Provenience Data for Cody Endscrapers

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Style	Tool Condition	Retouch	Scraping Edge Condition	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
1	3S/0E	150-160cm BS	10	flake	plano-convex	complete	extensive	mod used	BCCS29	6.72	3.68	1.61	35.55
2	98 South Block	150-160cm BS	5	flake	plano-convex	complete	moderate	mod used	BCCS38	5.93	3.91	2.90	41.25
4	8S/2W	150-160cm BS	9	flake	plano-convex	complete	moderate	min used	BCCS4	2.80	2.60	0.70	7.10
5	S1/E1	78cm BS	11	flake	plano-convex	dist-med frag	moderate	min used	BCCS21		2.50	0.70	4.00
6	S1/W1	79cm BS	11	flake	plano-convex	complete	moderate	mod used	CCCS9	2.90	2.10	0.77	4.77
7	S1/W5	58cm BS	11	flake	plano-convex	complete	minimal	min used	BCCS38	9.20	5.00	2.50	104.00
8	N1/W1	93cm BS	11	flake	plano-convex	complete	moderate	mod used	BCCS39	6.00	3.80	1.40	37.10
9	N1.W2	88cm BS	11	flake	plano-convex	complete	moderate	mod used	CCCS1	4.20	3.30	1.30	16.03
10	N1/W1	93cm BS	11	flake	plano-convex	dist-med frag	minimal	min used	BCCS47		3.90	7.90	26.86
11	N1/W1	94cm BS	11	flake	plano-convex	complete	moderate	min used	YBCCS22	3.10	2.20	0.60	4.40
12	S1/W3	85-97cm BS	11	flake	plano-convex	dist-med frag	moderate	min used	BCCS6	2.10	2.40	0.72	3.46
19	cutbank profile	39cm BS	1	flake	bi-plano	complete	moderate	mod used	BCCS6	6.03	3.05	0.83	24.00

Record #	Comments
1	Large endscraper with patterned unifacial retouch along exterior surfaces of both lateral margins and distal (scraping) edges.
2	Large endscraper with patterned unifacial retouch along exterior surfaces of one lateral margin and distal (scraping) edges.
3	Made on a flake fragment.
4	Forbis artifact #2200. Bending fracture removed proximal end.
5	Forbis artifact #2001.
6	Forbis artifact #2206. Very large piece.
7	Forbis artifact #2203.
8	Forbis artifact #2202.
9	Forbis artifact #2203.
10	Forbis artifact #2200.
11	Forbis artifact #2204. Small piece of distal margin missing.
12	Forbis artifact #2000.
19	Bliss and Hughes (1947) artifact #41; Smithsonian Institution National Museum of Natural History Accession #206347, Catalogue #406715.

Table 13: Metric, Nonmetric and Provenience Data for Cody Cores

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Core Type	Shape	Extent of Utilization	Condition	Retouch / Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
8	6S/6W	90-100cm BS	2	flake	unprepared	elongate flake	minimal	complete	none	YBCCS28	1.80	1.10	0.60	1.35
77	S1/W2	70cm BS	11	indeterminate	bifacial	ovoid	extensive	complete	none	YBCCS1a	7.90	4.40	2.70	83.95
92	SN2/W4	78cm BS	11	flake	unprepared	amorphous	extensive	complete	none	GBCCS20	7.30	5.70	2.60	111.00
93	N2/W8	63cm BS	11	cobble	unprepared	amorphous	moderate	complete	none	YBCCS38	6.56	6.40	3.60	136.00
94	N2/W8	60cm BS	11	cobble	unprepared	round	minimal	complete	none	BCCS1	7.80	6.70	3.60	209.00
96	N1/W3	60-75cm BS	11	indeterminate	unprepared	amorphous	extensive	complete	none	RCCS35	7.70	3.30	3.10	97.60
30	2000-A	140-160cm BS	4	small nodule	unprepared	blocky	minimal	complete	none	BCCS9	3.70	2.50	2.10	17.00
47	2008-SBE	100-120cm BS	3	indeterminate	bifacial	amorphous	extensive	complete	none	CCCS6	6.70	5.00	2.20	62.60
51	98 South Block	110-120cm BS	5	indeterminate	unprepared	amorphous	extensive	complete	none	BCCS44	7.00	7.00	3.50	131.00

Record #	Comments
8	NW quadrant (1m x 1m subdivision); very small decortication flake from which two micro-flakes were intentionally removed from interior surface.
77	Forbis artifact #4201.
92	Knudson artifact #6018.
93	Knudson artifact #6021.
94	Knudson artifact #6020; poor quality.
95	No matching debitage recovered at this lever. Piece is anomalous among the GBCCS18 debitage that dominates.
30	Very small minimally worked core exhibiting 3-4 small and random flake removal scars from two separate sides. The piece could only be reduced to any degree through bipolar reduction.
47	Random Flake removals from both faces.
51	Some cortex on exterior surface.

Table 14: Metric, Nonmetric and Provenience Data for Cody DEF/M

Record #	Excavation Unit	Excavation Level Depth	CMU	Debitage Type	Reduction Stage	Exterior Surface Flake Scar Count	Flake Scar Orientation	Lithic Material Code	Flake Shape	Flake Condition	Flake Termination Type	Platform Type
2	6S/6W	100-110cm BS	2	flake	secondary	2	parallel	BCCS41	ovate	complete	hinge	indeterminate
14	8S/2W	150-160cm BS	9	flake	secondary	2	intersecting	BCCS29	ovate	complete	feather	crushed
15	8S/2W	150-160cm BS	9	flake	secondary	3	intersecting	BCCS38	elongate	complete	feather	flat-beveled
16	8S/2W	150-160cm BS	9	flake	secondary	3	intersecting	BCCS38	elongate	complete	feather	
20	S1/W3	67cm BS	11	flake	secondary	0		SDQZT4e	ovate	complete	feather	point
21	N1/W2	100cm BS	11	flake	secondary	0		SDQZT2d	ovate	complete	feather	point
22	N1/W2	99cm BS	11	flake	secondary	0		SDQZT2d	ovate	complete	feather	point
23	N1/W1	99cm BS	11	flake	secondary	3	intersecting	GBCCS5	indeterminate	complete	feather	indeterminate
24	N1/W3	72cm BS	11	flake	secondary	2	parallel	BCCS4	elongate	complete	feather	faceted
25	N1/W3	76cm BS	11	flake	secondary	3	parallel	CCCS7	elongate	complete	feather	flat
26	S1/W4	73cm BS	11	flake	secondary	2	intersecting	GBCCS18	ovate	complete	feather	flat
27	N1/W4	79cm BS	11	flake	secondary	2	intersecting	CCCS7	elongate	complete	feather	flat
28	N1/W5	76cm BS	11	flake	secondary	2	intersecting	BCCS28	ovate	complete	feather	flat
47	cutbank profile	39cm BS	1	flake	secondary	3	intersecting	GBCCS18	ovate	complete	feather	crushed

Table 14: Metric, Nonmetric and Provenience Data for Cody DEF/M (con't)

Record #	Flake Type	Type of Edge Modification	Number of Retouched Edges	Size-Grade	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)	Comments
2	shaping /thinning	unifacial thinning	1	1	3.20	3.50	0.50	10.10	Steep, intentional, patterned flake removals along ½ the length of interior surface of lateral edge. Secondary flaking removed platform. Flake oriented on edge (vertically) when exposed *in situ.* Recovered from SW quadrant (1m x 1m subdivision).
14	shaping /thinning	unifacial thinning	1	1	6.80	5.60	0.50	27.44	Continuous and patterned flake removals from exterior surface of one lateral margin.
15	biface thinning	alternating unifacial thinning	3	1	10.30	5.20	1.10	70.95	Shallow, continuous and patterned flake removals from exterior surface of one lateral margin and distal edge. Similar retouch along interior surface of proximal margin.
16	shaping /thinning	unifacial thinning	1	1	8.90	4.45	0.90	40.30	Continuous and patterned flake removals from exterior surface of one lateral margin. The flake was longitudinally split during manufacture.
20	decortication	indeterminate	0	1	7.20	13.10	1.30	13.50	Forbis artifact #5205. Does not appear to have been used as a tool although Forbis refers to it as a teshoa. Lack of associated debitage is puzzling.
21	decortication	indeterminate	1	1	5.90	10.40	1.70	166.00	Forbis artifact #5206. Edges and interior surface are heavily worn/smoothed. Forbis refers to it as a teshoa, but the wear pattern suggests another use. Lack of associated debitage is puzzling.
22	decortication	indeterminate	1	1	5.90	7.90	1.60	107.00	Forbis artifact #5204. Edges and interior surface are heavily worn/smoothed. Forbis refers to it as a teshoa, but the wear pattern suggests another use. Lack of associated debitage is puzzling.
23	shaping /thinning	unifacial thinning	3	1	6.80	6.30	1.80	65.98	Forbis artifact #4200. Continuous, shallow, unifacial flaking along exterior surface margins.
24	biface thinning	unifacial thinning	2	2	6.20	2.40	0.70	9.58	Forbis artifact #3206. Shallow, unifacial flaking along exterior edge surfaces.
25	shaping /thinning	unifacial thinning	1	2	4.80	2.30	0.68	6.39	Forbis artifact # 1205. Shallow, unifacial flaking along one interior edge surface.
26	shaping /thinning	unifacial thinning	1	1	4.40	3.60	1.90	18.48	Forbis artifact #3203. Shallow, unifacial flaking along one short segment of interior lateral edge surface.
27	shaping /thinning	unifacial thinning	1	2	4.90	3.10	1.40	11.93	Forbis artifact #3214. Shallow, unifacial flaking along short segment of interior distal edge surface.
28	shaping /thinning	combination flaking	2	1	10.30	6.70	1.20	69.70	Forbis artifact #3222. Combination of unifacial and bifacial micro-flake removals along lateral edges.
47	shaping /thinning	unifacial thinning	3	1	7.30	5.70	1.20	58.70	Bliss and Hughes (1947) artifact #44; Smithsonian Institution National Museum of Natural History Accession #206347, Catalogue #406714. Continuous, shallow, unifacial flaking along exterior margins of one lateral edge and both ends.

Table 15: Flake Platform Morphology among Cody Unmodified Debitage

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
BCCS2			1	1		2
BCCS3		1	1			2
BCCS4	1		8	1		10
BCCS5			1			1
BCCS6	2		2			4
BCCS8	1					1
BCCS9	4	2	10			16
BCCS12						0
BCCS15		1				1
BCCS16						0
BCCS18	1					1
BCCS19			3			3
BCCS20			1			1
BCCS21	16	2	16	1		35
BCCS23	1					1
BCCS27	1	1	3			5
BCCS28	17	2	10			29
BCCS29	2	1	9			12
BCCS31		1				1
BCCS32	1					1
BCCS33						0
BCCS34						0
BCCS37		1				1
BCCS38	3		5			8
BCCS41	21	12	23	4		60
BCCS42				1		1
BCCS43	1		1			2
BCCS44	2		2			4
BCCS46	7		1			8
BPCCS2		1				1
BPCCS5		1				1
CCCS1	6	1	2	1		10
CCCS2	12	4	16	1		33
CCCS3	15	7	32	1		55
CCCS4	1		1			2
CCCS5	1					1
CCCS6	23	22	34	3		82
CCCS7	18	6	26	2		52
CCCS8	8	1	7	2		18
CCCS9		1		1		2
DAC1				1		1
GBCCS6			2			2
GBCCS11	1					1
GBCCS14			1			1
GBCCS16				1		1
GBCCS18	70	85	183	10	3	351
GBCCS20	25	25	54	3		107
GBCCS36			1			1
GBCCS38		1				1
GBCCS39	3					3
GBCCS43						0
GRAN5	6		1			7

Table 15: Flake Platform Morphology among Cody Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
OBS1			1			1
OBS2	1	7	10	2		20
QTZCRY1						0
QTZCRY1						0
RCCS3			5	2		7
RCCS4			4			4
RCCS6	6		5			11
RCCS8			1	1		2
RCCS9	1					1
RCCS11	2		2			4
RCCS12	3	2	7			12
RCCS13			1			1
RCCS14			3			3
RCCS16			1			1
RCCS19	7	2	16	1		26
RCCS20	1					1
RCCS21	1		2			3
RCCS22			3			3
RCCS26						0
RCCS27		1	3			4
RCCS29						0
RCCS31						0
RCCS32	2	2	2			6
RCCS33	2					2
RCCS47					1	1
RCCS48	2	2	9			13
SDQZT5e						0
WCCS1	1	1				2
WCCS4			1			1
WCCS5	4	3	4			11
WCCS6		1				1
WCCS8	1	1	1			3
WCCS10						0
WCCS11			2			2
WCCS12						0
WCCS15			1			1
WCCS18		1	1			2
YBCCS1a	1	2	1			4
YBCCS1b			1			1
YBCCS1d	1	2		2		5
YBCCS1e			1			1
YBCCS2	1	1	1			3
YBCCS3		1				1
YBCCS4	2	2	2	1		7
YBCCS5	1		1	1		3
YBCCS7	3					3
YBCCS8	1	1				2
YBCCS11		2				2
YBCCS12	2		1			3
YBCCS15		1				1
YBCCS18	1		1			2
YBCCS21				1		1

Table 15: Flake Platform Morphology among Cody Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
YBCCS22				1		1
YBCCS23						0
YBCCS24		1				1
YBCCS28	1					1
YBCCS29		1				1
YBCCS30	3	1	3			7
YBCCS31			1			1
YBCCS33a	2					2
YBCCS35	2		1			3
YBCCS37		1				1
YBCCS40		1	2			3
YBCCS42						0
YBCCS44	1					1
YBCCS45	2					2
YBCCS46	1					1
YBCCS50	2		2			4
YBCCS51	2	1				3
YBCCS52	1		1			2
YBCCS53				1		1
TOTAL	**334**	**220**	**561**	**47**	**4**	**1,166**

Table 16: Size-Grade and Weights for Cody Unmodified Debitage

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
BCCS2					6	3.25					**6**	**3.25**
BCCS3	1	21.76	1	1.55							**2**	**23.31**
BCCS4			1	1.13	8	2.57	1	0.05			**10**	**3.75**
BCCS5	1	14.55									**1**	**14.55**
BCCS6			1	4.7	3	1.65					**4**	**6.35**
BCCS8					2	1.05					**2**	**1.05**
BCCS9	5	173.07	10	34.67	3	1.69					**18**	**209.43**
BCCS12					1	1.91					**1**	**1.91**
BCCS15			1	3.4							**1**	**3.4**
BCCS16					1	0.38					**1**	**0.38**
BCCS18			1	6.65							**1**	**6.65**
BCCS19					3	2.05					**3**	**2.05**
BCCS20			1	5.45	1	1.45					**2**	**6.9**
BCCS21	6	154.79	12	67.22	20	7.68	6	0.95			**44**	**230.64**
BCCS23					1	0.25					**1**	**0.25**
BCCS27			1	5.1	3	1.0	2	0.2			**6**	**6.3**
BCCS28	1	28.7	13	72.04	22	10.0	1	0.15			37	110.89
BCCS29			3	4.6	14	4.7	2	0.2			19	9.5
BCCS31					1	0.7					1	0.7
BCCS32					1	0.1					1	0.1
BCCS33			1	1.6							1	1.6
BCCS34			1	1							1	1
BCCS37	1	41.6									1	41.6
BCCS38			9	22.48	9	3.9					18	26.38

Table 16: Size-Grade and Weights for Cody Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
BCCS41	5	101.07	26	76.03	51	23.16	1	0.05			83	200.31
BCCS42					1	0.15					1	0.15
BCCS43			1	2.4	3	2.1					4	4.5
BCCS44			2	2.95	2	1.45					4	4.4
BCCS46	1	10.3	5	14.9	4	2.3					10	27.5
BPCCS2					2	0.75					2	0.75
BPCCS5			1	6.75	2	0.55					3	7.3
CCCS1			4	11.01	17	9.9	1	0.05			22	20.96
CCCS2	2	24.43	15	48.57	19	6.54	5	0.7			41	80.24
CCCS3	3	59.3	27	59.11	54	25.35	4	0.55			88	144.31
CCCS4			1	6.75	1	0.55					2	7.3
CCCS5					1	1.05					1	1.05
CCCS6	24	568.63	59	208.09	43	20.49					126	797.21
CCCS7	7	90.01	21	218.15	43	17.17	3	0.45			74	325.78
CCCS8			7	19.95	19	7.65	2	0.15			28	27.75
CCCS9	2	28.12	1	1.84	3	2.54					6	32.5
DAC1			1	1.9							1	1.9
GBCCS6			2	1.51							2	1.51
GBCCS11			1	2.25							1	2.25
GBCCS14					2	2.0					2	2
GBCCS16					1	0.8					1	0.8
GBCCS18	81	2,070.67	191	578.43	264	145.06	13	1.15			549	2795.31
GBCCS20	33	858.35	64	185.78	100	45.2					197	1089.33
GBCCS36					1	0.1					1	0.1
GBCCS38			4	11.23							4	11.23
GBCCS39	1	16.45	1	2.05	3	0.8					5	19.3
GBCCS43					1	0.1					1	0.1
GRAN5	1	27.2	4	10.6	6	4.6					11	42.4
OBS1	1	3.64	1	4.53							2	8.17
OBS2			8	14.17	31	12.87	3	0.37			42	27.41
QTZCRY1					1	0.8					1	0.8
RCCS3			3	5.25	11	5.05	2	0.2			16	10.5
RCCS4			2	6.15	11	8.09	2	0.1			15	14.34
RCCS6	1	41.67	4	9.6	17	10.75	1	0.1			23	62.12
RCCS8			1	2.7	1	0.4					2	3.1
RCCS9			1	2.95							1	2.95
RCCS11			1	1.1	2	1.1	1	0.1			4	2.3
RCCS12			1	2.1	15	6.7	2	0.15			18	8.95
RCCS13	1	17.43									1	17.43
RCCS14					8	3.65	1	0.05			9	3.7
RCCS16					2	0.5					2	0.5
RCCS19			5	9.95	25	8.75	6	1.0			36	19.7
RCCS20	1	10.65									1	10.65
RCCS21			4	11.36							4	11.36

Table 16: Size-Grade and Weights for Cody Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
RCCS22			1	7.45	2	0.5	3	0.2			6	8.15
RCCS26			1	3.35	1	0.1					2	3.45
RCCS27			2	6.3	6	1.45					8	7.75
RCCS29			1	5.72							1	5.72
RCCS31			1	2.15							1	2.15
RCCS32			4	20.27	5	2.85	1	0.1			10	23.22
RCCS33			3	7.65							3	7.65
RCCS47					1	0.4					1	0.4
RCCS48	2	22.45	7	19.34	12	6.57	6	0.3			27	48.66
SDQZT5e					1	0.6					1	0.6
WCCS1			2	8.95			1	0.15			3	9.1
WCCS4			1	1.9	1	0.1					2	2
WCCS5	1	15.7	10	30.95	15	6.51					26	53.16
WCCS6			2	4.92							2	4.92
WCCS8	1	4.57			2	1.45					3	6.02
WCCS10					1	0.3					1	0.3
WCCS11					6	2.1	1	0.1			7	2.2
WCCS12					1	0.45					1	0.45
WCCS15					4	2.3					4	2.3
WCCS18	1	4.1	1	3.4							2	7.5
YBCCS1a			6	11.98	3	1.64					9	13.62
YBCCS1b					1	1.2					1	1.2
YBCCS1d	3	92.76	2	4.15	3	1.22					8	98.13
YBCCS1e			1	1.96							1	1.96
YBCCS2			1	1.12	2	1.7					3	2.82
YBCCS3			1	7.05							1	7.05
YBCCS4	1	6.55	5	10.53	2	0.85	2	0.25			10	18.18
YBCCS5					3	2.11	2	0.1			5	2.21
YBCCS7	2	88.7	1	1.2							3	89.9
YBCCS8					2	1.0					2	1
YBCCS11					2	2.33					2	2.33
YBCCS12					6	2.95					6	2.95
YBCCS15			2	3.6	1	0.05					3	3.65
YBCCS18					3	1.1					3	1.1
YBCCS21			1	2.48							1	2.48
YBCCS22					1	1.7					1	1.7
YBCCS23			1	8.55							1	8.55
YBCCS24			1	10.35							1	10.35
YBCCS28			1	1.55							1	1.55
YBCCS29			1	1.95	2	0.4					3	2.35
YBCCS30	1	27.73	2	16.9	6	2.13	1	0.1			10	46.86
YBCCS31					1	0.61					1	0.61
YBCCS33a			2	5.25							2	5.25
YBCCS35	2	80.93	2	11.85							4	92.78

Table 16: Size-Grade and Weights for Cody Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
YBCCS37	1	31.88									1	31.88
YBCCS40			2	2.6	1	0.1					3	2.7
YBCCS42			2	8.77							2	8.77
YBCCS44			1	3.6							1	3.6
YBCCS45			2	5.95							2	5.95
YBCCS46					1	0.65					1	0.65
YBCCS50			2	9.45	4	1.8					6	11.25
YBCCS51	1	16.28	2	8.65							3	24.93
YBCCS52			3	12.8							3	12.8
YBCCS53			1	3.21							1	3.21
TOTAL	**195**	**4,754.04**	**606**	**2,049.55**	**968**	**472.57**	**76**	**8.02**	**0**	**0**	**1,845**	**7,284.18**

Table 17: Morphology by Size Grade of Cody Unmodified Debitage

Size Grade	Complete Flakes	Broken Flakes	Flake Fragments	Shatter	Count
1	149	17	25	4	195
2	412	38	79	77	606
3	463	43	101	361	968
4	40	2	3	31	76
5	0	0	0	0	0
TOTAL	**1,064**	**100**	**208**	**473**	**1,845**

Table 18: Cody Component MANA Units and Associated Artifacts

MANA Designation	Projectile Point/Preform	Cultural Stone	Hafted Knife	Endscraper	Biface	Core	DEF/M	Debitage
BCCS1						1		0
BCCS2								6
BCCS3								2
BCCS4				1	1		1	10
BCCS5								1
BCCS6				2				4
BCCS8								2
BCCS9						1		18
BCCS12								1
BCCS15								1
BCCS16								1
BCCS18								1
BCCS19					1			3
BCCS20								2
BCCS21				1				44
BCCS23					2			1
BCCS27	1							6
BCCS28							1	37
BCCS29				1			1	19
BCCS31					1			1
BCCS32								1
BCCS33								1
BCCS34								1
BCCS37								1
BCCS38	1		1	2			2	18
BCCS39				1				0
BCCS41							1	83
BCCS42								1
BCCS43								4
BCCS44						1		4
BCCS46								10
BCCS47				1				0
BPCCS2								2
BPCCS5								3
CCCS1				1	2			22
CCCS2					2			41
CCCS3					1			88
CCCS4								2
CCCS5					1			1
CCCS6	1					1		126
CCCS7					6		2	74
CCCS8								28
CCCS9				1	1			6
DAC1	1							1
GBCCS5							1	0
GBCCS6								2
GBCCS10			1					0
GBCCS11								1
GBCCS14								2
GBCCS16								1
GBCCS18					10		2	549+
GBCCS20					1	1		197

Table 18: Cody Component MANA Units and Associated Artifacts (con't)

MANA Designation	Projectile Point/Preform	Cultural Stone	Hafted Knife	Endscraper	Biface	Core	DEF/M	Debitage
GBCCS36								1
GBCCS38								4
GBCCS39								5
GBCCS43								1
GRAN5								11
OBS1					1			2
OBS2								42
QTZCRY1								1
RCCS3								16
RCCS4								15
RCCS6								23
RCCS8								2
RCCS9								1
RCCS11								4
RCCS12								18
RCCS13								1
RCCS14								9
RCCS16								2
RCCS19								36
RCCS20					1			1
RCCS21								4
RCCS22								6
RCCS26								2
RCCS27								8
RCCS29								1
RCCS31								1
RCCS32								10
RCCS33								3
RCCS47								1
RCCS48								27
SDQZT2d							2	0
SDQZT4e							1	0
SDQZT5e								1
SLM4		1						0
WCCS1								3
WCCS4								2
WCCS5								26
WCCS6								2
WCCS8								3
WCCS10								1
WCCS11								7
WCCS12								1
WCCS15								4
WCCS18								2
YBCCS1a						1		9
YBCCS1b								1
YBCCS1d								8
YBCCS1e								1
YBCCS2								3
YBCCS3								1
YBCCS4	2							10
YBCCS5								5

Table 18: Cody Component MANA Units and Associated Artifacts (con't)

MANA Designation	Projectile Point/Preform	Cultural Stone	Hafted Knife	Endscraper	Biface	Core	DEF/M	Debitage
YBCCS7					1			3
YBCCS8								2
YBCCS11								2
YBCCS12								6
YBCCS15								3
YBCCS12								6
YBCCS15								3
YBCCS18								3
YBCCS21								1
YBCCS22				1				1
YBCCS23								1
YBCCS24								1
YBCCS28						1		1
YBCCS29								3
YBCCS30	1				2			10
YBCCS31								1
YBCCS33a								2
YBCCS35								4
YBCCS37								1
YBCCS38				1				0
YBCCS40								3
YBCCS42								2
YBCCS44								1
YBCCS45								2
YBCCS46								1
YBCCS50								6
YBCCS51								3
YBCCS52								3
YBCCS53								1

+ includes Knapping Features 3, 5, and 6 debitage

Table 19: Metric, Nonmetric and Provenience Data for Helena Component Projectile Points

Record #	Excavation Unit	Excavation Level Depth	CMU	Lithic Material Code	Condition	Preform	Type	Flaking Pattern	Cross Section	Outline Symmetry	Type of Notching
1	2000-5	0-20cm BS	4	CCCS3	body-base	flake	small side-notched	irregular	bi-plano	indeterminate	side
2	2000-B	40-60cm BS	4	YBCCS9	complete	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
3	4S/0E	30-40cm BS	10	CCCS3	tip	flake	indeterminate	edge	bi-plano	symmetrical	N/A
4	96 West Test	0-10cm BS	6	BCCS41	complete	flake	Late Period?	edge	bi-plano	symmetrical	corner
5	4S/0E	30-40cm BS	10	OBS2	complete	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
6	4S/0E	50cm BS60	10	CCCS3	complete	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
7	Unit 1	40-50cm B	7	RHY2	body-base	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
8	Unit 1	40-50cm BS	7	YBCCS18	complete	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
9	6S/4W	30-40cm BS	9	BCCS15	complete	indeterminate	Hanna	irregular	bi-convex	symmetrical	corner-removed
10	4S/0E	20-30cm BS	10	BCCS19	complete	flake	indeterminate	edge	plano-convex	symmetrical	corner
11	4S/0E	60-70cm BS	10	SDQZT5f	complete	indeterminate	Angostura	irregular	bi-convex	symmetrical	N/A
14	2N/0E	10-20cm BS	10	BCCS27	body-base	flake	indeterminate	irregular	bi-convex	symmetrical	N/A
15		surface	1	YBCCS40	complete	indeterminate	Plains side notched	irregular	bi-convex	symmetrical	side
16		surface	1	BCCS1	complete	flake	Oxbow	irregular	plano-convex	symmetrical	side
32	N1/W7	0-12cm BS	11	YBCCS41	complete	flake	Hanna	irregular	plano-convex	symmetrical	corner removed
33	N2/W3	0-5cm BS	11	YBCCS41	body-base	indeterminate	Hanna	irregular	bi-convex	symmetrical	corner removed
34	S1/W1	0-12cm BS	11	RCCS2	complete	biface	indeterminate corner-notched	irregular	bi-convex	asymmetrical	corner
35	N1/W2	0-10cm BS	11	YBCCS41	complete	flake	Pelican Lake?	irregular	bi-convex	symmetrical	corner
36	N2/W1	12-16cm BS	11	YBCCS55	complete	flake	Pelican Lake?	irregular	bi-convex	symmetrical	corner
37	N1/W1	30-32cm BS	11	BCCS18	complete	flake	Pelican Lake?	irregular	plano-convex	asymmetrical	corner
38	N1/W3	0-10cm BS	11	GBCCS19	complete	biface	Pelican Lake?	irregular	bi-convex	symmetrical	corner
39	N2/W1	15cm BS	11	RCCS21	complete	flake	Pelican Lake?	irregular	bi-convex	symmetrical	corner
40	N2/W1	0-10cm BS	11	GBCCS18	body-base	flake	Pelican Lake?	irregular	plano-convex	symmetrical	corner
41	N2/W1	10-15cm BS	11	CCCS2	complete	flake	Pelican Lake?	irregular	bi-convex	symmetrical	corner
42	N2/W1	6cm BS	11	CCCS7	complete	indeterminate	Pelican Lake?	irregular	bi-convex	symmetrical	corner
43	N2/W1	15-20cm BS	11	GBCCS18	complete	indeterminate	Prairie/Plains side-notched	irregular	bi-convex	symmetrical	side
44	S1/W4	8-12cm BS	11	OBS1	complete	indeterminate	Duncan/Hanna	irregular	bi-convex	N/A	corner removed
45	N5/W3	0-5cm BS	11	DAC1	base	indeterminate	indeterminate atlatl-size	irregular	bi-convex	N/A	N/A
46	S1/E4	15cm BS	11	BCCS21	body-tip	biface	indeterminate atlatl-size	irregular	bi-convex	N/A	N/A
47	N2/W4	6-12cm BS	11	YBCCS8	tip	indeterminate	Oxbow	irregular	bi-convex	symmetrical	side
48	S1/E2	0-15cm BS	11	GBCCS36	body-tip	biface	indeterminate	parallel	bi-convex	indeterminate	N/A

Table 19: Metric, Nonmetric and Provenience Data for Helena Component Projectile Points (con't)

Record #	Notch Shape	Basal Edge Shape	Fracture Type	Basal Edge Height (mm)	Base Height (mm)	Base Width (mm)	Shoulder Height (mm)	Shoulder Width (mm)	Neck Width (mm)	Neck Thickness (mm)	Notch Width (mm)	Notch Depth (mm)
1	small oval expanding	concave		3	3.00	4.10		6.10			3.10	1.80
2	small oval expanding	round-deep	N/A	2.1	2.10	5.20	2.50	6.20	6.70	10.01	3.60	5.30
3	small oval expanding		transverse									
4	small oval expanding	straight		1.87	1.87	5.87	8.52	5.29	14.16	7.93	3.46	4.74
5	small oval expanding	convex		2.4	2.40	6.57	16.45	7.12	19.11	12.59	4.33	4.62
6	small oval expanding	convex		2.18	2.18	6.46	12.86	6.50	17.16	9.54	3.47	3.80
7	small oval expanding	concave	transverse	2.47	2.47	6.02	13.03	6.21	21.82	11.85	4.12	6.29
8	small oval expanding	convex		4.18	4.18	6.81	14.02	7.14	18.79	12.80	3.10	3.70
9	large oval expanding	concave		2.34	2.34	7.69	13.65	9.17	20.60	10.97	4.25	7.40
10	round-shallow	concave		1.9	1.90	7.46	15.96	9.20	21.89	16.09	6.83	9.72
11		concave				17.38	10.10	17.38	19.97	14.21	4.78	
14			transverse									
15	small oval expanding	straight		4.5	4.50	5.50	13.60	8.00	12.40	8.30	2.30	3.10
16	round-shallow	concave		5.1	5.01	11.74	23.12	13.10	28.47	20.87	6.13	8.11
32	N/A	concave	N/A	2.24	10.18	17.00	12.29	24.83	16.14	5.85	13.00	2.55
33	N/A	concave	transverse	1.44	11.47	17.96	12.90	27.26	16.04	5.62	11.91	4.19
34	indeterminate	straight	N/A	2.00	7.80	13.65	10.90	15.44	13.35	3.91	6.50	2.59
35	large oval expanding	convex	N/A	3.09	7.95	17.11	8.92	21.21	12.90	3.42	4.99	4.31
36	round-shallow	convex	N/A	2.85	7.87	13.29	9.10	16.25	11.93	3.44	5.17	2.89
37	small oval expanding	straight	N/A	5.05	12.19	23.70	12.22	24.25	17.04	4.86	7.74	4.90
38	small oval expanding	concave	indeterminate	5.10	6.44		8.70	23.14	12.79	3.16	5.55	2.69
39	small oval expanding	straight	impact	3.35	5.90	16.36	6.32	19.87	13.66	2.90	3.58	2.63
40	small oval expanding	convex	N/A	3.12	5.77	16.57	7.99	17.33	12.93	3.83	4.06	2.61
41	large oval expanding	convex	N/A	2.39	6.09	12.72	6.37	17.87	9.71	2.89	4.41	3.15
42	small oval expanding	convex	N/A	4.20	7.83	14.05	8.57	20.07	12.83	3.97	5.44	2.79
43	small oval expanding	concave	impact	4.16	7.81	18.98	7.46	18.26	11.13	3.86	3.76	3.76
44	N/A	concave	indeterminate	1.80	10.08	14.98	11.39		14.71	5.77		
45	N/A	N/A	bending									
46	N/A	N/A	transverse									
47	round-shallow	deeply	impact	4.30	7.50	18.20	8.80	18.80	16.20	3.30	6.20	1.70
48	N/A	N/A	transverse									

Table 19: Metric, Nonmetric and Provenience Data for Helena Component Projectile Points (con't)

Record #	Body Length (mm)	Max Body Thickness (mm)	Max Length (mm)	Basal Notch Depth (mm)	Basal Notch Width (mm)	Hafted Retouch Index (mm)	Weight (gm)	Comments
1	11.10	3.10	15.30			N/A	4.70	Partial Late Period point pressure flaked into the lateral margin of a secondary reduction stage flake (SG2) with a flat platform.
2	17.50	4.20	20.19			0.00	1.30	Probably Pelican Lake, but arrow point-size.
3						N/A	0.40	Probably arrow point-size.
4	17.34	3.34	22.80			0.00	1.10	Arrow point-size, but uncertain whether it is a Prairie/Plains variant or Pelican Lake point.
5	23.06	4.84	30.20			0.00	2.35	XRF Sample o-11 (2018).
6	23.73	3.94	30.44			0.50	1.65	
7		4.33				0.00	3.20	
8	20.02	3.85	28.36			0.375	1.55	
9	18.20	5.43	26.34			0.751	2.95	Appears to be heavily re-sharpened. Re-sharpening likely gave the point its symmetry.
10	35.20	7.66	43.28			0.00	7.65	Stylistically non-descript. Uncertain if the artifact was completed. The blade curves slightly toward the tip on one side. Possibly intended as a hafted knife.
11	21.71	6.06	35.44			0.875	4.15	Heavily re-sharpened, Beveled base may be slightly ground along margin.
14		2.47				N/A	0.70	Arrow point-size. Probably broke during manufacture. Tip is curved on one side.
15	16.10	2.40	22.30			0.00	0.75	
16	23.08	7.94	37.10	2.75	10.42	0.875	9.25	Heavily re-sharpened so that the tip is more rounded than pointed. Impact burination scar remnant on interior surface at distal end. Found by Pamela Bompart in 2003 on ground surface (trail surface) approx. 20m NW of Forbis' 1951 excavation block.
32	24.20	5.28	36.19			0.312	6.84	Forbis artifact #1707.
33		5.75				N/A	8.96	Forbis artifact #1731.
34	10.28	4.25	19.35			0.562	1.55	Forbis artifact #1718.
35	25.14	4.64	34.13			0.0000	2.94	Forbis artifact #1715.
36	17.64	3.39	25.33			0.312	1.51	Forbis artifact #1728.
37	34.76	4.91	46.85			0.00	6.19	Forbis artifact #1712.
38	22.56	4.82	29.97			0.625	3.69	Forbis artifact #1714.
39		3.00				N/A	1.24	Forbis artifact #1726.
40	13.27	3.07	21.47			0.437	1.42	Forbis artifact #1729.
41	11.70	3.59	17.72			0.751	0.90	Forbis artifact #1727; heavily re-sharpened.
42	18.87	4.34	26.57			0.251	2.19	Forbis artifact #1724.
43	17.40	5.10	23.24			0.251	2.36	Forbis artifact #1725; impact burination fracture removed portion of the tip.
44						N/A	1.49	Forbis artifact #1723; XRF Sample #O-15.
45		3.65				N/A	1.82	Forbis artifact #1711; XRF Sample #D-30.
46		5.93				N/A	2.62	Forbis artifact #1701; likely broke during manufacture; some cortex on both surfaces.
47	17.20	4.20	26.1	3.2	15.1	0.625	2.77	Forbis artifact #1732; missing distal portion of the tip.
48		5.10				N/A	2.41	Forbis artifact #1704.

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
1	6S/6W	20-30cm BS	2	flake	ovate	bi-convex	II	complete	none	YBCCS1d	4.50	3.20	1.10	15.65
2	6S/6W	50-60cm BS	2	flake	ovate	convex-asymmetrical	III	distal fragment	none	RCCS19	2.00	2.80	0.50	4.05
6	2000-A	60-80cm BS	4	flake	ovate	bi-convex	II	proximal-medial fragment	none	YBCCS40	4.60	6.50	2.50	82.60
7	2000-B	60-80cm BS	4	indeterminate	triangular	bi-convex	III	complete	none	CCCS7	4.00	2.80	0.80	7.25
8	2000-B	60-80cm BS	4	flake	ovate	plano-convex	II	complete	none	DAC1	5.00	3.70	0.60	21.55
9	2000-B	80-100cm BS	4	flake	ovate	plano-convex	II	complete	none	GBCCS18	8.00	5.50	1.70	91.85
10	2000-B	80-100cm BS	4	indeterminate	ovate	bi-convex	II	complete	none	RCCS19	4.50	2.80	1.10	15.60
11	2000-C	0-20cm BS	4	indeterminate	ovate	bi-convex	II	distal fragment	none	BCCS19	2.50	4.00	1.00	13.45
12	2000-C	0-20cm BS	4	indeterminate	ovate	bi-convex	III	complete	none	CCCS7	5.70	4.30	1.10	28.60
13	2000-C	0-20cm BS	4	indeterminate	ovate	bi-convex	II	complete	none	YBCCS40	5.30	4.60	1.20	40.95
14	98-South Block	0-10cm BS	5	indeterminate	ovate	bi-plano	II	complete	none	YBCCS18	5.80	4.60	1.20	48.05
15	98-South Block	0-10cm BS	5	flake	ovate	plano-convex	II	complete	none	YBCCS4	6.00	5.50	1.20	42.05
22	2S/0E	40-50cm BS	10	indeterminate	ovate	bi-convex	II	complete	none	RCCS3	6.20	3.90	1.10	30.95
24	4S/0E	10-20cm BS	10	flake	amorphous	bi-convex	III	indeterminate fragment	none	BCCS7	4.20	3.10	0.40	11.10
25	14S/2E	20-30cm BS	9	flake	amorphous	bi-convex	III	complete	none	OBS1	2.90	1.20	0.40	1.85
26	0N/0E	20-30cm BS	10	indeterminate	indeterminate	bi-convex	III	indeterminate fragment	none	YBCCS3	2.00	4.40	1.00	8.55
28	14S/2E	10-20cm BS	9	indeterminate	ovate	bi-convex	II	proximal fragment	none	BCCS8	3.20	2.10	1.00	7.55
29	4S/0E	0-10cm BS	10	indeterminate	ovate	bi-convex	II	distal-medial fragment	none	RCCS3	7.00	4.00	0.90	19.95
30	4S/0E	30-40cm BS	10	indeterminate	ovate	bi-convex	III	distal-medial fragment	none	BCCS9	3.30	4.20	0.60	13.50
31	14S/2E	30-40cm BS	9	indeterminate	ovate	bi-convex	III	proximal fragment	none	BCCS43	1.50	3.10	0.70	3.60

Table 20: Metric, Nonmetric, and Provenience Data for Helena Component Bifaces (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
34	4S/0E	10-20cm BS	10	indeterminate	ovate	bi-convex	II	proximal-medial fragment	none	YBCCS1d	3.00	4.90	1.40	21.10
36	2S/0E	20-30cm BS	10	flake	ovate	bi-convex	III	proximal-medial fragment	none	CCCS6	2.50	3.80	0.80	10.25
37	98-South	40-50cm BS	5	indeterminate	ovate	bi-convex	III	complete	none	YBCCS18	4.00	3.00	0.60	11.65
39	2000-C	0-10cm BS	4	flake	ovate	bi-convex	III	distal-medial fragment	none	CCCS1	3.00	3.50	0.70	8.10
40	2000-C	0-10cm BS	4	indeterminate	indeterminate	bi-convex	III	complete	none	YBCCS33	5.70	4.10	0.50	20.65
41	2000-C	0-10cm BS	4	flake	ovate	plano--	II	complete	none	CCCS6	5.00	3.70	0.70	16.50
42	98-South Block	70-80cm BS	5	indeterminate	ovate	bi-convex	II	proximal-medial fragment	none	RCCS3	4.10	3.60	1.30	29.45
43	98-South	70-80cm BS	5	flake	ovate	plano-convex	II	complete	none	RCCS3	4.70	3.60	0.80	20.80
44	98-South	40-50cm BS	5	flake	ovate	plano-convex	II	complete	none	CCCS2	7.50	4.40	1.90	73.70
45		surface	1	indeterminate	ovate	bi-convex	III	complete	none	YBCCS40	2.10	1.60	0.40	2.00
46		surface	1	indeterminate	ovate	bi-convex	III	complete	none	RCCS2	2.20	1.50	0.40	1.65
47		surface	1	indeterminate	ovate	bi-convex	III	complete	none	BCCS29	3.60	2.50	0.50	8.45
49	6S/2W	10-20cm BS	9	flake	ovate	plano-convex	II	complete	none	YBCCS1d	4.80	2.70	0.90	13.70
50	6S/4W	20-30cm BS	9	flake	ovate	bi-convex	III	distal-medial fragment	none	BCCS43	3.20	4.20	0.80	14.75
52	98-South Block	40-50cm BS	5	indeterminate	ovate	bi-convex	III	distal-medial fragment	none	SDQZT1b	4.70	6.70	1.40	56.45
53	98-South Block	40-50cm BS	5	indeterminate	indeterminate	bi-convex	III	proximal-medial fragment	none	RCCS17	2.90	3.00	0.60	7.10
54	98-South Block	50-60cm BS	5	indeterminate	ovate	bi-convex	III	complete	none	BCCS23	4.50	3.60	0.60	14.45
55	98-South Block	50-60cm BS	5	flake	ovate	plano-convex	II	complete	none	RCCS14	5.20	3.40	0.80	20.40
56	2N/0E	10-20cm BS	10	flake	triangular	bi-convex	III	complete	none	RCCS19	2.65	1.50	0.28	0.70

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
57	98-South Block	30-40cm BS	5	flake	triangular	bi-convex	III	complete	none	BCCS21	2.10	1.45	0.41	2.35
58	2N/0E	20-30cm BS	10	flake	triangular	bi-convex	III	complete	none	RCCS32	2.10	1.80	0.60	1.55
59	6S/4W	20-30cm BS	9	flake	ovate	plano-convex	III	complete	none	BCCS9	2.60	2.00	0.40	2.80
60	98-South Block	50-60cm BS	5	indeterminate	ovate	bi-convex	II	indeterminate fragment	none	CCCS3	2.20	4.50	1.40	14.55
61	6S/4W	20-30cm BS	9	flake	ovate	plano-convex	II	complete	none	BCCS31	4.20	2.60	0.87	9.75
62	6S/4W	10-20cm BS	9	flake	ovate	bi-plano	II	complete	none	BCCS5	4.40	2.60	0.95	12.45
63	98-South Block	40-50cm BS	5	indeterminate	triangular	bi-convex	III	complete	none	BCCS28	5.50	3.70	1.30	26.00
96	N1/W5	21cm BS	11	indeterminate	ovate	bi-convex	III	complete	none	DAC1	6.10	2.10	0.67	10.76
97	N1/W5	15cm BS	11	indeterminate	ovate	bi-convex	II	distal-medial fragment	none	DAC1		3.90	0.84	15.45
98	N1/W7	15-30cm BS	11	flake	ovate	bi-convex	II	distal-medial fragment	none	DAC1		2.90	0.92	10.98
99	S2/W5	0-30cm BS	11	indeterminate	triangular	bi-convex	III	lateral half	none	DAC1	2.80		0.43	1.47
101	S1/E6	15-30cm BS	11	indeterminate	ovate	bi-convex	II	distal-medial fragment	none	GBCCS18		5.20	0.88	13.88
102	N1/W5	9cm BS	11	indeterminate	ovate	bi-convex	II	complete	none	BCCS29	4.70	2.80	0.72	10.26
103	N2/W1	15cm BS	11	indeterminate	ovate	plano-convex	II	complete	none	CCCS7	4.40	3.00	0.94	13.11
104	N2/W2	21cm BS	11	flake	ovate	plano-convex	III	complete	none	CCCS7	3.70	2.50	0.88	8.59
105	N2/W5	12cm BS	11	indeterminate	indeterminate	bi-convex	III	distal fragment	none	BCCS21		4.20	0.90	6.92
106	S1/E6	15-30cm BS	11	flake	ovate	bi-plano	III	complete	none	CCCS7	3.00	1.90	0.41	3.23
107	S1/W5	30-45cm BS	11	indeterminate	indeterminate	bi-convex	III	distal fragment	none	RCCS2		4.80	1.10	8.56
108	N1/W5	6cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	none	GBCCS20		2.70	0.87	7.52

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
109	S1/E1	6-12cm BS	11	indeterminate	ovate	bi-convex	II	distal-medial fragment	none	RCCS26		4.60	1.40	30.39
110	N3/W4	30-36cm BS	11	flake	ovate	plano-convex	II	complete	none	CCCS7	5.30	3.70	1.30	26.10
111		surface	1	indeterminate	ovate	bi-convex	II	complete	none	BCCS43	4.00	3.30	1.10	16.61
112	N1/W1	surface	11	indeterminate	indeterminate	bi-convex	III	proximal fragment	unifacial retouch of lateral edge and distal end	BCCS21		6.50	1.30	18.43
113	N1/W7	15-30cm BS	11	flake	ovate	bi-convex	II	distal-medial fragment	none	GBCCS20		3.90	1.20	29.57
114	S1/E2	0-3cm BS	11	flake	ovate	bi-convex	II	complete	none	CCCS7	3.90	3.50	1.20	18.39
115	N1/W2	24cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	none	BCCS7		2.70	0.80	7.13
116	S1/E6	15-30cm BS	11	flake	ovate	bi-convex	II	complete	none	BCCS21	4.20	2.80	0.80	9.99
117	N1/W1	30cm BS	11	indeterminate	indeterminate	bi-convex	III	proximal-medial fragment	none	BCCS9		3.20	0.67	5.89
118	N1/W2	36cm BS	11	indeterminate	indeterminate	bi-convex	III	medial fragment	none	BCCS21		3.30	0.97	12.78
119	S1/E6	15-30cm BS	11	flake	ovate	bi-convex	II	distal-medial fragment	none	GBCCS20	5.10	2.80	1.00	14.50
120	S1/W4	9-12cm BS	11	flake	ovate	bi-convex	II	complete	none	GBCCS20	4.50	3.30	1.00	19.92
121	N2/W2	6cm BS	11	indeterminate	ovate	bi-convex	III	complete	none	BCCS21	4.20	3.90	1.30	26.71
122	N1/W3	0-9cm BS	11	indeterminate	ovate	bi-convex	III	distal-medial fragment	none	SDQZT5a		3.70	0.97	24.08
123	N1/W1	27cm BS	11	indeterminate	ovate	bi-convex	III	complete	none	BCCS9	4.10	2.80	0.95	13.24

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
124	S1/W2	12-15cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	none	RCCS2		2.80	0.60	4.96
125	N2/W2	12cm BS	11	indeterminate	indeterminate	bi-convex	III	proximal fragment	none	CCCS7		4.80	1.10	17.71
126	S1/E6	15-36cm BS	11	indeterminate	indeterminate	bi-convex	III	proximal fragment	none	BCCS21		5.60	0.89	11.15
127	N1/W2	21-30cm BS	11	indeterminate	triangular	bi-convex	III	complete	none	BCCS7	4.90	2.90	0.57	9.66
128	N2/W5	21cm BS	11	indeterminate	rectangular	irregular	II	complete	none	CCCS3	6.40	3.00	0.74	22.85
129		surface	1	indeterminate	ovate	bi-convex	II	complete	none	BCCS9	5.40	3.90	1.20	26.61
130	N1/W5	15cm BS	11	indeterminate	ovate	bi-convex	II	complete	none	BCCS37	6.50	4.10	1.00	29.39
131		surface	1	flake	ovate	bi-convex	II	proximal-medial fragment	none	YBCCS50		3.90	1.20	24.55
132	N1/W3	3-6cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	none	CCCS7		3.50	0.77	10.09
133	N2/W2	15cm BS	11	flake	indeterminate	bi-convex	II	distal-medial fragment	none	BCCS44		5.90	1.50	40.26
134	N1/W2	24-30cm BS	11	indeterminate	ovate	bi-convex	II	complete	none	YBCCS1d	4.00	3.60	0.74	13.18
135	N2/W1	9-12cm BS	11	indeterminate	indeterminate	bi-convex	III	proximal-medial fragment	none	YBCCS43		2.60	0.73	5.15
136	N1/W2	24-30cm BS	11	flake	ovate	plano-convex	II	complete	none	YBCCS45	3.40	2.60	6.50	5.83
138	N1/W3	3cm BS	11	indeterminate	ovate	irregular	II	complete	none	RCCS12	5.40	2.80	1.10	17.56
139	N2/W2	15cm BS	11	indeterminate	ovate	irregular	II	complete	none	RCCS15	7.70	6.60	1.70	83.75
140		surface	1	indeterminate	ovate	bi-convex	III	complete	none	BCCS32	5.10	3.60	0.93	17.32
141	S1/E6	15-30cm BS	11	indeterminate	ovate	plano-convex	II	complete	none	CCCS3	4.80	3.20	1.00	18.98
142	S1/E6	15-30cm BS	11	indeterminate	indeterminate	bi-convex	III	distal-medial fragment	none	GBCCS20		4.80	0.90	13.24

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Cross Section	Reduction Stage	Tool Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
143	N2/W6	48cm BS	11	flake	triangular	plano-convex	III	complete	none	BCCS38	4.80	2.10	0.66	6.52
144		surface	1	indeterminate	triangular	bi-convex	III	proximal-medial fragment	none	BCCS9		2.10	0.35	1.88
146	N1/W1	30cm BS	11	indeterminate	ovoid	bi-convex	III	proximal-medial fragment	none	RCCS48		2.40	0.55	4.86

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Comments	Record #	Comments
1	Possibly intended as a medium-size projectile point preform. Thickened area on one lateral edge.	**29**	Transverse fracture. Probably broke during manufacture. Potlid on interior surface.
2	Transverse fracture. Probably broke during manufacture.	**30**	Transverse fracture. Probably broke during manufacture.
6	Possible transverse fracture suggests breakage during manufacture.	**31**	Transverse fracture. Probably broke during manufacture.
7	Possible medium-size projectile point preform.	**34**	Transverse fracture. Probably broke during manufacture.
8	XRF Sample D-23 (2018)	**36**	Transverse fracture. Probably broke during manufacture.
9		**37**	
10		**39**	Transverse fracture. Probably broke during manufacture.
11	Transverse fracture. Probably broke during manufacture.	**40**	
12	Reconstructed from two pieces found among debitage. Transverse fracture. Probably broke during manufacture.	**41**	
13		**42**	Transverse fracture. Probably broke during manufacture.
14		**43**	Initial efforts to create a biface on a flake with a thick flat-platform and
15		**44**	
22		**45**	Possible arrow point-size preform.
24		**46**	Possible arrow point-size preform.
25	XRF Sample O-10 (2018). Small, bifacially worked (thoroughly pressure-flaked) cutting/scraping implement.	**47**	Possible Medium-size point preform.
26	Probably broke during manufacture.	**49**	
28	Transverse fracture. Probably broke during manufacture.	**50**	Transverse fracture. Probably broke during manufacture.

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Comments	Record #	Comments
52	Transverse fracture. Probably broke during manufacture.	**106**	Forbis artifact #1733. Probably a small-size projectile point preform.
53	Transverse fracture. Probably broke during manufacture. May be a large, lanceolate projectile point preform.	**107**	Forbis artifact #3702. Transverse fracture. Probably broke during manufacture.
54	Transverse fracture. Probably broke during manufacture.	**108**	Forbis artifact #3706. Transverse fracture. Probably broke during manufacture.
55		**109**	Forbis artifact #3740. Transverse fracture. Probably broke during manufacture.
56	Possible arrow point-size preform.	**110**	Forbis artifact #3701. Probably a medium-size projectile point preform.
57	Possible arrow point-size preform.	**111**	Forbis artifact #3700. Probably a small to medium-size projectile point preform. Found 200 yards west of MacHaffie Site proper.
58	Possible arrow point-size preform. Very tip is missing but otherwise complete.	**112**	Forbis artifact #3738. Transverse fracture. Probably broke during manufacture.
59	Possible arrow point-size preform.	**113**	Forbis artifact #3730. Transverse fracture. Probably broke during manufacture.
60	Transverse fracture. Probably broke during manufacture.	**114**	Forbis artifact #3707. Probably a medium-size projectile point preform.
61		**115**	Forbis artifact #3712. Transverse fracture. Probably broke during manufacture.
62		**116**	Forbis artifact #3739. Probably a small to medium-size projectile point preform.
63	Transverse fracture. Probably broke during manufacture.	**117**	Forbis artifact #3712. Transverse fracture. Probably broke during manufacture.
96	Forbis artifact # 1700; XRF Sample # D-26; Missing extreme portion of distal end.	**118**	Forbis artifact #1702. Transverse fractures. Probably broke during manufacture.
97	Forbis artifact # 3725; XRF Sample # D-27; piece likely broke during manufacture.	**119**	Forbis artifact #3742. Transverse fracture. Probably broke during manufacture.
98	Forbis artifact # 1710; XRF Sample # D-28; piece likely broke during manufacture.	**120**	Forbis artifact #3719. Probably a small to medium-size projectile point preform.
99	Forbis artifact # 1708; XRF Sample # D-29; piece likely broke during manufacture; appears to be a arrow-point size preform.	**121**	Forbis artifact #3703. Probably a small to medium-size projectile point preform. Some limestone cortex on both surfaces.
101	Forbis artifact #3736. Transverse fracture. Probably broke during manufacture.	**122**	Forbis artifact #3711. Transverse fracture. Probably broke during manufacture.
102	Forbis artifact #3721. Probably a small to medium-size projectile point preform.	**123**	Forbis artifact #3720. Probably a small-size projectile point preform.
103	Forbis artifact #2710. Probably a small to medium-size projectile point preform.	**124**	Forbis artifact #3708. Transverse fracture. Probably broke during manufacture. Probably a small to medium-size projectile point preform.
104	Forbis artifact #1717. Probably a small-size projectile point preform.	**125**	Forbis artifact #3710. Transverse fracture. Probably broke during manufacture.
105	Forbis artifact #3732. Transverse fracture. Probably broke during manufacture.	**126**	Forbis artifact #3729. Transverse fracture. Probably broke during manufacture.

Table 20: Metric, Nonmetric and Provenience Data for Helena Component Bifaces (con't)

Record #	Comments	Record #	Comments
127	Forbis artifact #1720/1721. Probably a small to medium-size projectile point preform that broke during manufacture. Found in two pieces during excavation, but rejoined.	**136**	Forbis artifact #3709. Minimally retouched on both faces. Probably a small-size projectile point preform.
128	Forbis artifact #3744. Probably a medium-size projectile point preform.	**138**	Forbis artifact #3723. Probably a medium-size projectile point preform.
129	Forbis artifact #3731. Probably a medium-size projectile point preform. Found 100 yards northeast of MacHaffie Site proper.	**139**	Forbis artifact #3728. Small quarry blank.
130	Forbis artifact #3713. Probably a medium-size projectile point preform. One side is sunbleached. Arises are worn and polished. The piece appears to have been tumbled in water.	**140**	Forbis artifact #3724. Probably a medium-size projectile point preform. The piece was not found at the MacHaffie Site.
131	Forbis artifact #3717. Transverse fracture. Probably broke during manufacture. Found 500 yards west of MacHaffie Site proper.	**141**	Forbis artifact #2715. Probably a medium-size projectile point preform. Some cortex on one surface.
132	Forbis artifact #3715. Transverse fracture. Probably broke during manufacture.	**142**	Forbis artifact #3741. Transverse fracture. Probably broke during manufacture.
133	Forbis artifact #4702. Transverse fracture. Probably broke during manufacture.	**143**	Forbis artifact #1501. Provenienced as between Helena and Cody Components by Forbis but unclear why. Probably a medium-size point preform. Both faces fully flaked.
134	Forbis artifact #3704. Inverted V-shaped piece missing from proximal end. Probably broke during manufacture.	**144**	Forbis artifact #1719. Probably a small-size point preform that broke during manufacture. Found 15 yards east of Forbis' tent.
135	Forbis artifact #3737. Transverse fracture. Probably broke during manufacture.	**146**	Forbis artifact #1713. Probably a small or medium-size projectile point preform.

Table 21: Metric, Nonmetric and Provenience Data for Helena Component Endscrapers

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Style	Tool Condition	Retouch	Scraping Edge Condition	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
3	14S/2E	30-40cm BS	9	flake	thin/flat flake	complete	moderate	minimally used	BCCS46	3.20	2.80	0.50	6.50
13	S1/W3	21-36cm BS	11	flake	plano-convex	distal-medial	moderate	moderately used	BCCS18		2.70	0.54	5.07
14	S1/W1	39-55cm BS	11	flake	plano-convex	complete	minimal	minimally used	WCCS5	3.80	2.30	1.40	9.56
15	N2/W2	30cm BS	11	flake	plano-convex	complete	minimal	moderately used	BCCS18	2.60	2.40	0.87	7.83
16	N2/W1	3-6cm BS	11	flake	thin/flat flake	distal fragment	moderate	minimally used	WCCS16		2.60	0.48	2.57
17	S1/W3	9cm BS	11	flake	thin/flat flake	complete	moderate	moderately used	WCCS5	6.40	3.40	1.00	28.05
18	S1/E1	46-49cm BS	11	flake	thin/flat flake	complete	moderate	moderately used	RCCS6	3.50	2.60	0.56	7.65

Record #	Comments
3	Found in two pieces. Glued together to make a complete endscraper. Cortex covers one lateral edge.
13	Forbis artifact #2708.
14	Forbis artifact #2500. Made on heavily sun-bleached material.
15	Forbis artifact #2706.
16	Forbis artifact #2712.
17	Forbis artifact #2702.
18	Forbis artifact #2201.

Table 22: Metric, Nonmetric and Provenience Data for "Helena Component" Burins/Gravers

Record #	Excavation Unit	Excavation Level Depth	CMU	Lithic Material Code	Artifact Type	Integrity	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)	Comments
6	96 West Test	40-50cm BS	6	CCCS8	graver	complete	1.40	1.50	0.25	0.70	Made on a complete secondary reduction flake. Possible graver is a short and thin flaked projection at one lateral edge. The projection is 2mm long, 4mm wide at its base and tapers to 2mm wide at its tip, which may be slightly truncated (broken).
7	4S/0E	30-40cm BS	10	GBCCS18	graver	complete	2.04	2.47	0.31	1.85	Made on a secondary flake fragment. Possible graver is a short and needle-like flaked projection at one lateral edge. The projection is 3.4mm long, 5mm wide at it base and tapers to 1.1mm wide at its tip.
9	6S/4W	10-20cm BS	9	BCCS21	graver	complete	2.10	2.90	0.45	2.70	Made on an ovate, secondary flake with a crushed platform. Shallow, steep, unifacial flaking produced on a short and needle-like projection along distal edge. The projection is 2.6mm long, 5mm wide at its base and tapers to 1.7mm wide at its tip.

Table 23: Metric, Nonmetric and Provenience Data for "Helena Component" Spokeshaves

Record #	Excavation Unit	Excavation Level Depth	CMU	Debitage Type	Reduction Stage	Exterior Surface Flake Scar Count	Flake Scar Orientation	Lithic Material Code	Flake Shape	Flake Condition	Flake Termination Type	Platform Type	Flake Type
12	Unit 1	0-10cm BS	7	flake	secondary	2	intersecting	BCCS29	ovate	complete	feather	point	shaping/thinning
17	2000-B	0-20cm BS	4	flake	secondary	1		BCCS21	indeterminate	fragment			shaping/thinning

Record #	Type of Edge Modification	Number of Retouched Edges	Size Grade	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)	Comments
12	unifacial flaking	1	2	2.30	1.91	0.56	2.60	Possible spokeshave. Shallow, continuous and patterned flake removals from exterior surface of distal margin produced a circular notch that measure 0.76mm wide x 0.31mm deep.
17	unifacial flaking	2	1	2.90	1.40	0.90	3.55	Steep, nearly 90° flake removals give the notch a flattened base. Notch measure 1.7mm wide x 0.4mm tall.

Table 24. Metric, Nonmetric and Provenience Data for "Helena Component" Cores

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Core Type	Shape	Extent of Utilization	Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
2	6S/6W	30-40cm BS	2	cobble	unprepared	discoidal	moderate	complete	none	SDQZT4b	14.00	12.50	3.00	907.20
3	6S/6W	80-90cm BS	2	indeterminate	bipolar	amorphous	extensive	fragment	none	BCCS21	2.00	1.80	1.10	5.00
4	6S/6W	30-40cm BS	2	indeterminate	unprepared	amorphous	extensive	complete	none	BCCS12	3.20	3.40	2.40	23.65
6	6S/6W	0-10cm BS	2	indeterminate	bifacial	bifacial	extensive	fragment	none	BPCCS5	4.30	3.00	1.30	14.55
7	6S/6W	60-70cm BS	2	pebble	bipolar	amorphous	minimal	complete	none	WCCS19	2.70	3.50	2.40	16.00
9	6S/6W	20-30cm BS	2	pebble	bipolar	amorphous	minimal	complete	none	CCCS2	1.50	2.70	1.00	4.50
10	8S/6W	20-30cm BS	2	indeterminate	unprepared	blocky	moderate	complete	none	CCCS7	8.00	5.50	3.20	11.70
11	TU-1	20-40cm BS	3	indeterminate	unprepared	amorphous	extensive	complete	possible	BCCS3	2.00	4.80	2.10	12.65
23	2000-C	0-20cm BS	4	block	unprepared	blocky	extensive	complete	none	YBCCS4	13.00	12.00	8.00	1,275.70
24	2000-C	0-20cm BS	4	block	unprepared	blocky	extensive	complete	none	BCCS44	9.80	7.80	7.10	652.00
25	2000-C	0-20cm BS	4	indeterminate	bifacial	bifacial	extensive	complete	none	CCCS7	8.50	5.50	4.00	155.90
26	2000-C	0-20cm BS	4	indeterminate	unprepared	amorphous	extensive	complete	none	CCCS7	6.60	6.20	2.30	128.20
27	2000-C	0-20cm BS	4	small nodule	unprepared	amorphous	extensive	complete	none	RCCS31	6.90	5.90	3.50	99.20

***Possible retouch or grinding along platform edge

Table 24: Metric, Nonmetric and Provenience Data for "Helena Component" Cores (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Core Type	Shape	Extent of Utilization	Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
28	2000-5	0-20cm BS	4	small nodule	unprepared	amorphous	extensive	complete	none	YBCCS3	4.00	4.00	2.40	28.15
32	2000-A	40-60cm BS	4	small nodule	unprepared	amorphous	minimal	complete	none	RCCS13	5.50	5.60	3.90	149.00
33	2000-A	0-20cm BS	4	indeterminate	unprepared	amorphous	moderate	complete	none	BCCS41	6.90	3.00	3.00	70.45
34	2000-A	20-40cm BS	4	indeterminate	unprepared	amorphous	moderate	complete	none	RCCS48	6.00	4.00	3.10	80.50
35	2000-A	20-40cm BS	4	flake	unprepared	ovate	moderate	complete	none	YBCCS35	5.50	5.20	2.10	71.70
36	2000-B	0-20cm BS	4	large nodule	unprepared	blocky	moderate	complete	none	YBCCS18	9.60	10.70	7.40	1,013.00
37	2000-B	0-20cm BS	4	small nodule	bifacial	ovate	moderate	complete	none	BCCS28	9.00	6.20	4.30	262.00
38	2000-B	0-20cm BS	4	indeterminate	unprepared	blocky	moderate	fragment	none	RCCS2	5.80	3.50	3.20	93.80
40	2000-B	20-40cm BS	4	indeterminate	bifacial	ovate	moderate	complete	none	YBCCS1a	4.90	3.00	1.90	39.20
41	2000-B	20-40cm BS	4	indeterminate	unprepared	amorphous	minimal	complete	none	BCCS21	4.80	3.40	2.70	36.25
42	2000-C	0-20cm BS	4	flake	unprepared	ovate	moderate	complete	none	BCCS41	7.00	6.20	3.10	130.00
43	2000-C	0-20cm BS	4	indeterminate	bipolar	amorphous	extensive	complete	none	BCCS1	5.20	3.40	2.40	40.00
44	2000-C	0-20cm BS	4	small nodule	unprepared	amorphous	minimal	complete	none	BCCS21	4.70	3.30	2.30	35.35
48	98-South	10-20cm BS	5	medium	unprepared	nodular	minimal	complete	none	YBCCS50	6.60	8.30	5.50	369.00
49	98-South	50-60cm BS	5	medium	unprepared	nodular	moderate	complete	none	BCCS41	9.50	9.00	4.50	274.00
50	98-South	60-70cm BS	5	indeterminate	bifacial	bifacial	moderate	complete	none	BCCS28	4.00	3.50	1.50	29.00
52	96-West Test	60-70cm BS	6	indeterminate	unprepared	blocky	moderate	complete	none	CCCS6	7.50	4.70	3.70	216.00
53	96-West Test	60-70cm BS	6	flake	bifacial	triangular	moderate	complete	none	BCCS41	5.50	4.60	2.10	68.00
54	96-West Test	60-70cm BS	6	indeterminate	bifacial	ovate	extensive	complete	none	BCCS46	5.00	4.50	1.80	41.00
55	Unit 1	20-30cm BS	7	small nodule	unprepared	blocky	minimal	complete	none	BCCS9	5.50	5.50	4.00	196.00
56	6S/4W	40-50cm BS	9	flake	bifacial	ovate	moderate	complete	none	BCCS21	6.50	4.50	2.50	74.85
57	6S/4W	70-80cm BS	9	pebble	bipolar	amorphous	moderate	complete	none	BCCS41	3.50	3.20	2.40	25.20
61	14S/2E	0-10cm BS	9	indeterminate	bipolar	amorphous	extensive	fragment	none	BCCS9	3.20	1.80	1.20	6.70
62	2000-C	0-20cm BS	4	indeterminate	polyhedral?	conical	extensive	complete	none	BCCS21	1.50	2.90		8.75
63	98-South	50-60cm BS	5	medium	unprepared	amorphous	moderate	complete	none	CCCS7	7.80	5.10	5.00	219.00
64	8S/4W	60-70cm BS	9	indeterminate	bifacial	ovate	extensive	complete	none	BCCS21	6.90	4.90	1.80	77.00
65	14S/2E	30-40cm BS	9	pebble	bipolar	ovate	extensive	complete	none	BCCS21	3.10	2.80	1.20	9.40
66	98-South	20-30cm BS	5	indeterminate	unprepared	amorphous	extensive	complete	none	CCCS7	4.70	3.80	2.30	36.00
67	98-South	40-50cm BS	5	indeterminate	unprepared	amorphous	moderate	complete	none	CCCS6	6.60	4.00	2.20	63.00
68	6S/4W	20-30cm BS	9	medium	unprepared	amorphous	moderate	complete	none	BCCS41	7.60	6.70	4.30	168.00
69	2000-5	0-20cm BS	4	small nodule	unprepared	amorphous	extensive	complete	none	YBCCS3	4.00	4.00	2.40	28.15
70	2000-A	40-60cm BS	4	small nodule	unprepared	amorphous	minimal	complete	none	RCCS13	5.50	5.60	3.90	149.00

Table 24: Metric, Nonmetric and Provenience Data for "Helena Component" Cores (con't)

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Core Type	Shape	Extent of Utilization	Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
71	98-South	30-40cm BS	5	indeterminate	unprepared	amorphous	extensive	complete	none	BCCS41	4.10	4.10	2.50	44.00
74	2S/0E	30-40cm BS	10	medium	unprepared	amorphous	extensive	complete	none	YBCCS51	10.20	5.00	3.00	145.00
76	2N/0E	40-50cm BS	10	indeterminate	unprepared	ovate	extensive	complete	none	BCCS43	7.10	5.00	2.10	89.55
83	S1/W4	9-12cm BS	11	indeterminate	unprepared	amorphous	extensive	complete	none	GBCCS5	4.70	3.20	2.00	24.27
84	S1/E6	15-30cm BS	11	indeterminate	bifacial	ovate	moderate	complete	none	GBCCS20	6.70	4.80	2.80	79.57
85	S1/W4	9-12cm BS	11	flake	bifacial	ovate	moderate	complete	none	YBCCS18	6.10	4.60	1.90	57.15
86	N1/W1	27cm BS	11	flake	bifacial	square	minimal	complete	none	GBCCS36	4.10	4.30	1.30	30.46
87	N2/W5	18cm BS	11	indeterminate	bifacial	ovate	moderate	complete	none	GBCCS5	4.80	4.20	1.50	32.96
88	N2/W2	15cm BS	11	indeterminate	bifacial	ovate	moderate	complete	none	CCCS7	7.20	5.90	3.00	126.00
89	S1/E6	15-30cm BS	11	flake	bifacial	ovate	minimal	complete	none	GBCCS20	8.80	6.70	2.70	180.00
90	N2/W2	15cm BS	11	cobble	unprepared	amorphous	extensive	complete	none	BCCS44	5.80	6.50	3.80	147.00
91	N2/W2	21cm BS	11	block	unprepared	amorphous	minimal	complete	none	BCCS43	9.40	5.60	2.90	172.00
97	N2/W6	15-30cm BS	11	nodule	unprepared	amorphous	moderate	complete	none	YBCCS42	5.00	4.50	2.10	57.00
98	N2/W4	0-15cm BS	11	indeterminate	bifacial	ovate	extensive	complete	none	BCCS21	7.20	5.00	3.50	91.00
99	N1/W2	15-30cm BS	11	indeterminate	bifacial	ovate	extensive	complete	none	YBCCS1a	10.60	6.90	3.50	228.00
100	N1/W2	30-45cm BS	11	indeterminate	unprepared	ovate	minimal	complete	none	YBCCS4	6.00	4.10	2.50	88.00
101	N1/W2	15-30cm BS	11	indeterminate	unprepared	amorphous	moderate	complete	none	GBCCS11	6.30	4.50	2.80	65.00

Table 24: Metric, Nonmetric and Provenience Data for "Helena Component" Cores (con't)

Record #	Comments	Record #	Comments
2	SW quadrant (1x1 m subdivision); flattened cobble gives the piece a natural, roughly disc-shaped appearance. Five flake removals along margin; four removed from one face and one from opposite side.	**7**	NE quadrant (1x1 m subdivision)
3	NW quadrant (1x1 m subdivision); flattened cobble gives the piece a natural, roughly disc-shaped appearance. Five flake removals along margin; four removed from one face and one from opposite side.	**9**	SW quadrant (1x1 m subdivision)
4	SW quadrant (1x1 m subdivision); exhausted flake core.	**10**	NW quadrant (1x1 m subdivision); random flake removals across surface. Piece is still viable for hard hammer reduction.
6	SW quadrant (1x1 m subdivision)	**11**	Possible bipolar core, not suitable for free-hand reduction work. Exhibits desire to produce small (short and thin) and straight flakes.

Table 24: Metric, Nonmetric and Provenience Data for "Helena Component" Cores (con't)

Record #	Comments	Record #	Comments
23	Many imperfections throughout the piece. Difficult to reduce into large flakes.	**63**	
24	Still useable piece. Final series of randomly removed flakes were small (SG2) and straight.	**64**	Core is difficult to describe. Something like a small cone from which very small flakes run vertically parallel. How this piece was supported for striking flakes off
25	Still useable piece. Cortex covers most of one surface.	**65**	Some cortex on one surface.
26	Still useable piece. Final series of randomly removed flakes were small (SG2) and straight.	**66**	
28	Still useable piece. Some cortex on both lateral edges on one side.	**67**	
29	Largely exhausted (too small) for free-hand reduction work.	**68**	
30	Very poor quality material. Numerous internal vugs and fractures.	**69**	
31	Some cortex remains on the core surface.	**70**	
34		**71**	
36	Unifacial flake core.	**74**	Discontiguous cortex on one surface.
37	Cortex covers one end.	**76**	
39	Flakes randomly removed from two opposing surfaces.	**83**	Forbis artifact #2709
40	Still useable core of good quality material.	**85**	Forbis artifact #4708
41	Flakes randomly (minimally) removed from two opposing surfaces.	**86**	Forbis artifact #4700
42		**87**	Forbis artifact #4500
43	Random flake removals from all surfaces.	**88**	Forbis artifact #3746
44		**89**	Forbis artifact #4704
48	Random flake removals. Some cortex on exterior surface.	**90**	Forbis artifact #4705
49	Some cortex on exterior surface.	**91**	Forbis artifact #4707
50	Some cortex on exterior surface. Moderate quality chert.	**97**	Forbis artifact #4706
52	Some cortex on exterior surface.	**98**	Cortex covers one face.
53	Some cortex on one face.	**99**	
54		**100**	Numerous vugs and cavities throughout the piece.
55	Most flake scars (5-6 total) removed portions of the cortex, but tool quality of the piece is marginal.	**101**	
61	Might be described as a Stage I biface. Cortex covers much of one surface.		
62	Poor quality. Hard to tell where cortex ends and interior material begins.		

Table 25: Metric, Nonmetric and Provenience Data for "Helena Component" DEF/M

Record #	Excavation Unit	Excavation Level Depth	CMU	Preform	Shape	Extent of Utilization	Condition	Retouch /Use Wear	Lithic Material Code	Max Length (cm)	Max Width (cm)	Max Thickness (cm)	Weight (gm)
1	6S/6W	0-10cm BS	2	flake	secondary	3	intersecting	BCCS41	elongate	fragment			shaping/thinning
3	2000-6	60-80cm BS	4	flake	secondary	2	parallel	YBCCS1d	elongate	complete	feather	flat	shaping/thinning
4	2000-6	20-40cm BS	4	flake	secondary	1		YBCCS1a	indeterminate	fragment			shaping/thinning
7	2000-A	40-60cm BS	4	flake	secondary	1		CCCS7	indeterminate	fragment	feather	indeterminate	shaping/thinning
8	2000-A	20-40cm BS	4	flake	secondary	2	parallel	YBCCS4	ovate	complete	feather	flat	shaping/thinning
9	2000-C	60-80cm BS	4	flake	secondary	5	intersecting	WCCS5	ovate	complete	feather	flat	shaping/thinning
10	98-South	0-10cm BS	5	flake	secondary	5	intersecting	BCCS16	triangular	complete	feather	flat	shaping/thinning
11	96-West Test	40-50cm BS	6	flake	secondary	1		DAC1	elongate	complete	feather	point	shaping/thinning
13	2N/0E	0-10cm BS	10	flake	secondary	2	intersecting	BCCS41	ovate	complete	feather	flat	shaping/thinning
18	6S/2W	10-20cm BS	9	flake	secondary	3	intersecting	GBCCS18	elongate	complete	feather	flat	biface thinning
19	98-South	70-80cm BS	5	flake	secondary	2	parallel	WCCS14	elongate	broken		point	shaping/thinning
33	S1/E1	0-5cm BS	11	flake	secondary	5	intersecting	OBS1	elongate	complete	feather	point	biface thinning
34	S1/E6	15-30cm BS	11	flake	secondary	3	intersecting	OBS1	elongate	complete	feather	point	shaping/thinning
35	S1/E6	15-30cm BS	11	flake	secondary	2	intersecting	CCCS2	elongate	complete	feather	flat	shaping/thinning
36	N2/W1	18-21cm BS	11	flake	secondary	5	intersecting	CCCS2	indeterminate	fragment	feather	indeterminate	biface thinning
37	N1/W6	0-15cm BS	11	flake	secondary	3	intersecting	YBCCS4	ovate	complete	feather	flat	shaping/thinning
38	N1/W6	0-15cm BS	11	flake	secondary	4	intersecting	BCCS46	elongate	complete	feather	flat	shaping/thinning
39	S1/W4	9-12cm BS	11	flake	secondary	2	intersecting	SDQZT4m	elongate	fragment	feather	indeterminate	shaping/thinning
40	N2/W2	6-9cm BS	11	flake	secondary	4	intersecting	RCCS2	ovate	complete	feather	crushed	shaping/thinning
41	N1/E2	0-3cm BS	11	flake	secondary	9	intersecting	RCCS5	elongate	fragment	feather	indeterminate	finishing
42	N1/W3	3-6cm BS	11	flake	secondary	3	intersecting	BCCS47	elongate	fragment	feather	indeterminate	shaping/thinning
43	N1/W4	3-6cm BS	11	flake	secondary	4	intersecting	YBCCS4	elongate	complete	feather	flat	shaping/thinning
44	N3/W4	12-15cm BS	11	flake	secondary	3	intersecting	YBCCS35	elongate	complete	feather	flat	shaping/thinning
45	S1/E6	15-30cm BS	11	flake	secondary	3	intersecting	RCCS8	elongate	complete	feather	flat	shaping/thinning

Table 25: Metric, Nonmetric and Provenience Data for "Helena Component" DEF/M (con't)

Record #	Comments
1	Shallow and erratic flake removals have formed a somewhat jagged edge. Probably formed through cutting or scraping hard material. Recovered from NW quadrant (1 x 1 m subdivision).
3	Patterned unifacial flake removals along exterior surface of distal margin.
4	Shallow and erratic flake removals from exterior surface of one lateral edge.
7	Shallow, but continuous and patterned flake removals from exterior surface of distal edge.
8	Shallow, steep-angled, continuous, and patterned flake removals from interior surface of one lateral edge.
9	A thick (plano-convex) flake with shallow, steep-angled, continuous, and patterned flake removals from exterior surfaces of both lateral edges.
10	Shallow but continuous and patterned flake removals. Unifacial flaking along exterior surface of distal margin and one lateral edge. Bifacial flaking along other lateral edge.
11	XRF Sample D-24 (2018). Shallow, continuous flake removals from interior surface of distal margin. The retouch exhibits a dull polish. The secondary flaking has a flattened appearance presumably from the degree of wear it has experienced.
13	Shallow, continuous and patterned flake removals from exterior surface of distal margin.
18	Shallow, continuous and patterned flake removals from exterior surface of intact lateral margin. Flake is longitudinally split.
19	Shallow, continuous and patterned flake removals from exterior surface of one lateral margin.
33	Forbis artifact # 3743; XRF Sample O-12. Shallow and nearly continuous intentional flake removals from exterior surface of both lateral margins.
34	Forbis artifact #1734. Shallow, unifacial and bifacial flaking around perimeter.
35	Forbis artifact #2718. Shallow, unifacial flaking of exterior surface of one lateral edge and distal end.
36	Forbis artifact #3714. Shallow, unifacial flaking along a short segment of exterior surface of one lateral margin.
37	Forbis artifact #3734. Bifacial retouch along proximal edge, and shallow, unifacial flaking along exterior surface of distal edge.
38	Forbis artifact #2716. Shallow, unifacial flaking along exterior surfaces of both lateral edges. The piece appears to be part of a core.
39	Forbis artifact #3718. Shallow, unifacial flaking along exterior surface of one lateral edge and distal end.
40	Forbis artifact #2711. Shallow, unifacial flaking along exterior surface of distal end.
41	Forbis artifact #1722. Bifacial retouch along both lateral margins and distal end.
42	Forbis artifact #2704. Shallow, unifacial flaking along exterior surface of both lateral margins and distal end.
43	Forbis artifact #2720. Shallow, unifacial flaking along exterior surface of a rounded projection at distal end of flake.
44	Forbis artifact #5700. Continuous, shallow, unifacial flaking along exterior surfaces of both lateral margins.
45	Forbis artifact #3735. Shallow, sporadic bifacial flaking of exterior surface of one lateral edge.

Table 26: Flake Platform Morphology: Helena Component Unmodified Debitage

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
BCCS1		1	4			5
BCCS2	2		5			7
BCCS3	3		2			5
BCCS4	7	3	4			14
BCCS5	2	3	9	1		15
BCCS6	1	4	4			9
BCCS7	5	2	5	1		13
BCCS8	16	3	9	2		30
BCCS9	97	31	134	11	1	274
BCCS11	2		2			4
BCCS12	6	4	14	3		27
BCCS13			1			1
BCCS14	1		1			2
BCCS15	4		3			7
BCCS16	12		14	1		27
BCCS18	6	2	8			16
BCCS19	8		5	2		15
BCCS20	1	1	2	1		5
BCCS21	144	34	310	20	2	510
BCCS23	7	3	22	1		33
BCCS25		1	2			3
BCCS26	6					6
BCCS27	1	2	2			5
BCCS28	42	7	73	8		130
BCCS29	18	1	16	2		37
BCCS31	8	1	5	2		16
BCCS32		1	2	1		4
BCCS33	1		4	1		6
BCCS34	1	1				2
BCCS35	2		3			5
BCCS37	1	1	3	1		6
BCCS38	31	5	61	1		98
BCCS39	5	1		1		7
BCCS40		1	3			4
BCCS41	138	22	110	19	1	290
BCCS42	6		4	1		11
BCCS43	8		16	3		27
BCCS44	31	6	14	1		52
BCCS45	2		1	1		4
BCCS46	35	12	40	9	1	97
BCCS47	4					4
BPCCS2	1	1	1	1		4
BPCCS5	7	4	19			30
CCCS1	36	10	54	3		103
CCCS2	102	28	143	15		288
CCCS3	159	33	261	14	3	470
CCCS4	4	3	5	2		14
CCCS5	18		9			27
CCCS6	16	10	27	2		55
CCCS7	207	45	193	19	1	465
CCCS8	39	8	51	5		103
CCCS9	5	5	28	3		41

Table 26: Flake Platform Morphology: Helena Component Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
DAC1	5	6	26	5	1	43
GBCCS3	2	1				3
GBCCS5	11	2	10	4		27
GBCCS6	1					1
GBCCS9	3	3	11	2		19
GBCCS11	1		1			2
GBCCS13	1					1
GBCCS14	3	1	1			5
GBCCS15			1			1
GBCCS16	1	1				2
GBCCS17			1			1
GBCCS18	81	54	120	13	2	270
GBCCS19			1	1		2
GBCCS20	43	6	14	4		67
GBCCS21			3			3
GBCCS26			2			2
GBCCS28			3			3
GBCCS31	2	2				4
GBCCS36	7	3	4	3		17
GBCCS38	18	8	11	2	1	40
GBCCS39	10		11			21
GBCCS41			3			3
GBCCS66	13	1	11	1		26
GRAN1a			1			1
GRAN5	8		3			11
OBS1		2		1		3
OBS2	2		5	2		9
OQTZ2			1			1
QTZCRY1						0
RCCS1	4	2				6
RCCS2	11	3	11	2		27
RCCS3	28	6	50	3		87
RCCS4	31	4	47	3	1	86
RCCS5	3	1	6			10
RCCS6	15	4	62		1	82
RCCS7	3		4			7
RCCS8	8	1	3	1		13
RCCS9	1	1	2			4
RCCS11	12	1	18	1		32
RCCS12	12	5	20	4		41
RCCS13	8	2	3			13
RCCS14	4	2	3	1		10
RCCS15						0
RCCS16	2	1	5		1	9
RCCS17			1			1
RCCS18	1		1	1		3
RCCS19	45	8	115	11		179
RCCS20	1					1
RCCS21	4		18	2		24
RCCS22	4		3			7
RCCS23	1		1			2
RCCS24	2					2

Table 26: Flake Platform Morphology: Helena Component Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
RCCS25		1				1
RCCS26	8	1	7	1		17
RCCS27	2		4			6
RCCS29				1		1
RCCS30	2	1	4			7
RCCS31	2			1		3
RCCS32	11	2	27	3		43
RCCS33	5	1	3	2		11
RCCS34	1					1
RCCS35						0
RCCS37	1		2			3
RCCS47	7		20	2		29
RCCS48	42	4	69	6		121
RCCS56	2		3			5
SDQZT2a						0
SDQZT5k	2		1			3
WCCS1	2		2			4
WCCS2	2	1	6			9
WCCS3	1		1			2
WCCS4	3		2			5
WCCS5	51	10	68	9		138
WCCS6			1			1
WCCS7	1		2			3
WCCS8	3		2	1		6
WCCS9			1	1		2
WCCS10			1			1
WCCS11	1	1	6	1		9
WCCS12		1	1			2
WCCS13			2			2
WCCS14	1		2			3
WCCS15	9	1	9	2		21
WCCS16	2			1	1	4
WCCS17		1	1			2
WCCS18	11	2	2	1		16
WCCS19	1					1
YBCCS1a	46	16	58	4		124
YBCCS1b	3	1	4	1		9
YBCCS1c			1			1
YBCCS1d	16	4	19	5		44
YBCCS1e	5	1	2			8
YBCCS2	2		5	1		8
YBCCS3	3		6			9
YBCCS4	64	16	72	4		156
YBCCS5	12	1	4	2		19
YBCCS6	1		5			6
YBCCS7	1	1	3			5
YBCCS8	6		2			8
YBCCS9	6	6	27			39
YBCCS11			2			2
YBCCS12		2	9			11
YBCCS14	1		1			2
YBCCS15	1	1	2	1		5

Table 26: Flake Platform Morphology: Helena Component Unmodified Debitage (con't)

MANA Designation	Flat	Faceted	Point	Crushed	Flat-beveled	Count
YBCCS16	1		1			2
YBCCS17	1					1
YBCCS18	8	5	13	2	2	30
YBCCS21	3		7			10
YBCCS22	3		7	3		13
YBCCS23	3	1	3			7
YBCCS24	4		3	1		8
YBCCS25						0
YBCCS27			1			1
YBCCS28			2			2
YBCCS29				2		2
YBCCS30	48	9	91	1		149
YBCCS31	14	1	10	4		29
YBCCS32			2			2
YBCCS33a	4	3	5	1		13
YBCCS33b	5	2	5	2		13
YBCCS34		1				1
YBCCS35	2		9	1		12
YBCCS36	5	1	2	2		10
YBCCS37	3			3		6
YBCCS38	11	1	6	1		19
YBCCS39	2		1			3
YBCCS40	22	4	21	4	1	52
YBCCS41	1	2	3			6
YBCCS42	2		1			3
YBCCS43	1		2			3
YBCCS44			3			3
YBCCS45	9		3			12
YBCCS46						0
YBCCS47						0
YBCCS48	2					2
YBCCS49	2		1			3
YBCCS50	39	8	33	7		87
YBCCS51	8	2	23			33
YBCCS52	6	1				7
YBCCS53	2					2
YBCCS54	1					1
YBCCS55	2		3	1		6
YBCCS56	1	1				2
TOTAL	**2,225**	**549**	**3,057**	**310**	**20**	**6,161**

Table 27: Size-Grade and Weights for Helena Component Unmodified Debitage

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
BCCS1			2	10.5	1	1.0	3	0.75			6	12.25
BCCS2			6	28.12	7	5.55	1	0.15			14	33.82
BCCS3			1	3.2	6	3.22					7	6.42
BCCS4	3	50.05	11	38.87	9	6.19	2	0.3			25	95.41
BCCS5			5	17.95	14	10.48	2	0.25			21	28.68
BCCS6			6	14.71	5	3.22					11	17.93
BCCS7	1	13.4	5	10.42	14	8.69					20	32.51
BCCS8	1	12.13	21	97.3	24	13.22	2	0.2			48	122.85
BCCS9	20	438.02	179	657.91	280	214.07	19	3.76			498	1,313.76
BCCS11			3	8.25	1	0.3	1	0.1			5	8.65
BCCS12	1	9.9	15	49.61	33	24.19					49	83.7
BCCS13							1	0.25			1	0.25
BCCS14					2	2.05					2	2.05
BCCS15					8	5.15	5	0.55			13	5.7
BCCS16	2	63.07	23	103.48	14	7.95	2	0.2			41	174.7
BCCS18	2	23.95	8	17.83	11	9.57	4	0.35			25	51.7
BCCS19	2	75.85	7	21.76	16	10.95					25	108.56
BCCS20	1	23.05	8	25.26	1	1.15					10	49.46
BCCS21	17	381.39	199	630.8	587	266.22	16	2.48			819	1,280.89
BCCS23	9	239.08	10	33.47	26	13.46	8	0.95			53	286.96
BCCS25			4	7.95	3	3.22					7	11.17
BCCS26	6	123.75									6	123.75
BCCS27					7	3.15					7	3.15
BCCS28	7	186.0	36	137.12	142	65.3	24	3.2			209	391.62
BCCS29	1	16.75	17	35.58	44	29.12	4	0.6			66	82.05
BCCS31			18	72.75	3	2.2	2	0.25			23	75.2
BCCS32			2	5.59	3	1.1	1	0.15			6	6.84
BCCS33					9	3.2					9	3.2
BCCS34					2	0.95	1	0.2			3	1.15
BCCS35	1	94.0	4	12.35	1	0.7					6	107.05
BCCS37	1	9.35	5	10.9	4	2.95					10	23.2
BCCS38	12	338.92	62	235.04	84	60.0	21	1.57			179	635.53
BCCS39	1	20.2	3	14.08	4	5.78	1	0.3			9	40.36
BCCS40	1	8.01	2	3.35	1	0.4	1	0.2			5	11.96
BCCS41	29	702.6	124	406.37	237	274.6	35	4.6			425	1,388.17
BCCS42			5	14.65	9	3.05					14	17.7
BCCS43			9	27.2	32	18.98	3	0.4			44	46.58
BCCS44	7	175.31	42	162.28	50	35.29	3	0.5			102	373.38
BCCS45			3	4.51	2	2.15					5	6.66
BCCS46	8	232.23	67	274.53	89	64.23					164	570.99
BCCS47	1	15.7	3	7.53	4	1.92					8	25.15
BPCCS2			3	5.06	2	1.1					5	6.16
BPCCS5			13	42.91	35	19.91	2	0.25			50	63.07
CCCS1	5	201.37	49	169.64	116	64.8	12	1.25			182	437.06
CCCS2	12	214.68	137	471.56	387	229.41	22	2.9			558	918.55
CCCS3	14	376.66	181	464.29	491	260.8	66	8.57			752	1,110.32
CCCS4			12	26.76	5	2.86					17	29.62
CCCS5	9	209.28	19	73.69	8	6.5	1	0.15			37	289.62
CCCS6	15	310.32	25	98.21	40	15.93	3	0.36			83	424.82
CCCS7	27	619.96	267	843.2	454	259.62	35	5.35			783	1,728.13
CCCS8	4	163.55	44	191.16	112	57.22	8	1.05			168	412.98

Table 27: Size-Grade and Weights for Helena Component Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
CCCS9			35	98.19	65	41.39	2	0.35			102	139.93
DAC1	5	46.97	28	230.51	45	22.96	1	0.1			79	300.54
GBCCS3			1	2.35	4	5.57					5	7.92
GBCCS5	1	16.52	23	89.29	19	10.64					43	116.45
GBCCS6			1	8.25							1	8.25
GBCCS9	1	31.55	19	62.5	8	3.4					28	97.45
GBCCS11			1	7.92	3	2.35	1	0.1			5	10.37
GBCCS13			1	2.38	1	0.63					2	3.01
GBCCS14	1	15.32	4	9.64	1	0.35					6	25.31
GBCCS15			1	1.75							1	1.75
GBCCS16	1	20.1	1	2.4	1	0.53					3	23.03
GBCCS17					1	0.3					1	0.3
GBCCS18	26	389.66	173	501.45	251	210.69	6	1.09			456	1,102.89
GBCCS19			2	3.74			1	0.1			3	3.84
GBCCS20	15	343.27	48	209.2	52	41.74	6	0.75			121	594.96
GBCCS21			3	3.84							3	3.84
GBCCS26	1	17.6	3	5.66							4	23.26
GBCCS28					3	0.85					3	0.85
GBCCS31			4	8.19							4	8.19
GBCCS36	1	33.55	9	26.35	12	8.85					22	68.75
GBCCS38	5	139.61	36	84.65	29	16.08					70	240.34
GBCCS39	8	180.52	8	31.99	17	9.4	2	0.3			35	222.21
GBCCS41					3	0.75	2	0.5			5	1.25
GBCCS66			16	95.37	12	7.99	5	0.5			33	103.86
GRAN1a			1	2.6	1	0.95					2	3.55
GRAN5	2	103.25	5	30.42	8	6.3	1	0.05			16	140.02
OBS1			3	6.53	3	1.76					6	8.29
OBS2			1	2.45	10	3.88	1	0.05			12	6.38
OQTZ2	1	11.2									1	11.2
QTZCRY1					1	1.15					1	1.15
RCCS1			7	25.08							7	25.08
RCCS2	1	49.6	21	69.94	28	14.91	1	0.1			51	134.55
RCCS3	2	45.67	24	82.9	112	57.32	19	2.9			157	188.79
RCCS4	2	49.9	29	126.98	113	70.74	7	1.05			151	248.67
RCCS5			5	16.25	21	16.73	2	0.3			28	33.28
RCCS6	2	52.4	13	39.5	145	78.5	18	2.15			178	172.55
RCCS7			4	10.75	7	5.05					11	15.8
RCCS8	1	17.82	10	24.8	8	3.7					19	46.32
RCCS9			1	1.71	2	1.61	3	0.4			6	3.72
RCCS11			2	3.3	36	18.23	5	0.7			43	22.23
RCCS12			12	44.8	60	38.73	4	0.7			76	84.23
RCCS13			16	51.81	5	3.49	1	0.1			22	55.4
RCCS14	1	10.87	6	26.58	5	3.65					12	41.1
RCCS15			1	2.49							1	2.49
RCCS16	1	22.85	5	12.3	9	4.75					15	39.9
RCCS17					2	0.85					2	0.85
RCCS18			3	5.34	1	0.55					4	5.89
RCCS19	2	30.3	43	101.92	186	79.32	25	3.45			256	214.99
RCCS20					1	0.7					1	0.7

Table 27: Size-Grade and Weights for Helena Component Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
RCCS21			18	52.39	43	22.27					61	74.66
RCCS22	1	27.54	4	16.19	9	4.94	3	0.1			17	48.77
RCCS23			2	4.33							2	4.33
RCCS24					5	4.32					5	4.32
RCCS25			1	0.9							1	0.9
RCCS26			6	19.62	20	7.41					26	27.03
RCCS27			6	14.21	8	3.45					14	17.66
RCCS29			1	0.9							1	0.9
RCCS30			7	14.1	1	0.4					8	14.5
RCCS31			3	10.4	2	0.8					5	11.2
RCCS32	2	34.03	23	97.12	53	37.98	3	0.35			81	169.48
RCCS33	1	24.05	8	24.0	7	3.92	5	0.75			21	52.72
RCCS34			2	3.35							2	3.35
RCCS35			1	3.28							1	3.28
RCCS37			1	4.7	5	1.51					6	6.21
RCCS47			4	14.07	29	13.7	12	1.85			45	29.62
RCCS48	7	179.25	38	98.09	157	68.91	30	4.64			232	350.89
RCCS56					5	2.85					5	2.85
SDQZT2a	1	7.44			1	0.51					2	7.95
SDQZT5k			3	12.25	3	1.95					6	14.2
WCCS1	1	11.2			5	7.9					6	19.1
WCCS2	1	19.4	5	10.29	4	1.8					10	31.49
WCCS3			4	8.4			2	0.3			6	8.7
WCCS4	1	9.9	3	13.28	4	2.3	1	0.15			9	25.63
WCCS5	3	52.23	70	186.04	166	75.97	17	2.3			256	316.54
WCCS6			1	2.25	1	0.55					2	2.8
WCCS7					5	3.75					5	3.75
WCCS8			2	12.82	6	3.93					8	16.75
WCCS9			1	9.9	1	0.43					2	10.33
WCCS10			1	1.8	4	2.7					5	4.5
WCCS11			1	1.49	6	1.1	2	0.25			9	2.84
WCCS12					2	1.3					2	1.3
WCCS13					4	1.8					4	1.8
WCCS14			2	26.75	2	1.45					4	28.2
WCCS15	1	53.27	30	107.57	32	24.26	1	0.15			64	185.25
WCCS16			2	10.8	3	1.93					5	12.73
WCCS17			2	5.85	4	3.15					6	9
WCCS18			6	18.1	16	9.5	1	0.25			23	27.85
WCCS19					1	1.3					1	1.3
YBCCS1a	7	200.49	44	136.88	107	76.66	20	2.6			178	416.63
YBCCS1b	1	16.95	5	6.89	5	1.95	1	0.1			12	25.89
YBCCS1c			1	3.35							1	3.35
YBCCS1d	2	45.45	25	66.97	38	21.28	4	0.6			69	134.3
YBCCS1e			7	18.97	11	8.14					18	27.11
YBCCS2			4	15.67	8	5.91					12	21.58
YBCCS3			1	3.2	9	5.17					10	8.37
YBCCS4	9	1,163.31	80	285.07	119	68.88	24	4.05			232	1,521.31
YBCCS5			5	11.74	21	15.26	1	0.25			27	27.25
YBCCS6			1	3.05	8	2.62					9	5.67

Table 27: Size-Grade and Weights for Helena Component Unmodified Debitage (con't)

MANA Designation	Size-Grade by Count and Weight										TOTAL	
	1	Weight (gm)	2	Weight (gm)	3	Weight (gm)	4	Weight (gm)	5	Weight (gm)	Count	Weight (gm)
YBCCS7			2	2.7	4	1.78					6	4.48
YBCCS8			14	43.17	4	3.51					18	46.68
YBCCS9	3	45.23	9	37.03	55	27.58					67	109.84
YBCCS11			1	3.0	2	0.92					3	3.92
YBCCS12			3	8.1	14	6.13					17	14.23
YBCCS14			2	4.4							2	4.4
YBCCS15			2	5.05	5	2.0	1	0.2			8	7.25
YBCCS16	1	24.95					1	0.25			2	25.2
YBCCS17	1	25.75									1	25.75
YBCCS18	1	0.85	7	32.14	38	17.65	1	0.25			47	50.89
YBCCS21			8	24.08	11	6.89	3	0.4			22	31.37
YBCCS22	1	45.7	12	35.35	10	7.88					23	88.93
YBCCS23			9	56.11			7	1.25			16	57.36
YBCCS24	3	52.6	6	21.91	4	2.97					13	77.48
YBCCS25					1	0.2					1	0.2
YBCCS27			1	4.0	1	0.17					2	4.17
YBCCS28			3	7.7							3	7.7
YBCCS29					2	1.52					2	1.52
YBCCS30	11	200.46	61	253.82	111	37.68	14	2.1			197	494.06
YBCCS31	5	120.87	17	65.0	29	20.24	3	0.55			54	206.66
YBCCS32			2	3.65	2	1.1					4	4.75
YBCCS33a	1	24.96	8	20.56	11	5.9					20	51.42
YBCCS33b	2	30.63	4	12.81	9	4.7	3	0.5			18	48.64
YBCCS34	1	12.45									1	12.45
YBCCS35	2	50.25	6	18.4	8	5.81					16	74.46
YBCCS36	1	15.9	7	23.04	5	3.15					13	42.09
YBCCS37			5	21.35	10	5.77					15	27.12
YBCCS38	2	153.35	5	14.63	18	14.34					25	182.32
YBCCS39	1	10.9	2	1.55							3	12.45
YBCCS40	2	44.5	23	65.23	49	27.95	2	0.6			76	138.28
YBCCS41			1	5.55	8	6.05	1	0.4			10	12.0
YBCCS42			4	15.56	1	0.35					5	15.91
YBCCS43	1	19.8	1	2.7	4	2.24					6	24.74
YBCCS44							3	0.35			3	0.35
YBCCS45	3	35.85	9	38.67	2	0.9	2	0.35			16	75.77
YBCCS46					2	1.15					2	1.15
YBCCS47					1	1.2					1	1.2
YBCCS48	1	17.4	2	4.56	1	0.15					4	22.11
YBCCS49			3	19.45	1	1.35					4	20.8
YBCCS50	9	201.18	31	88.56	65	41.01	6	0.85			111	331.6
YBCCS51	1	15.02	19	68.8	31	20.79	9	1.55			60	106.16
YBCCS52	1	23.55	7	18.56	3	2.95					11	45.06
YBCCS53	2	35.84	2	12.77	2	1.44					6	50.05
YBCCS54					1	0.45					1	0.45
YBCCS55			6	13.5	2	1.15					8	14.65
YBCCS56	2	18.47	1	1.2							3	19.67
TOTAL	**396**	**10,048.03**	**3,031**	**0,199.94**	**6,197**	**3,713.34**	**607**	**86.17**	**0**	**0**	**10,231**	**24,047.48**

Table 28: Morphology by Size-Grade of Helena Component Unmodified Debitage

Size-Grade	Complete Flakes	Broken Flakes	Flake Fragments	Shatter	Count
1	306	20	33	37	396
2	1,891	238	340	562	3,019
3	3,148	230	648	2,173	6,175
4	322	7	75	203	607
5	0	0	0	0	0
TOTAL	**5,667**	**495**	**1,094**	**2,975**	**10,231**

Table 29: Helena Component MANA Units and Associated Artifacts

Mana Designation	Projectile Point/Preform	Graver	Spokeshave	Endscraper	Biface	Core	DEF/M	Debitage
BCCS1	1					1		6
BCCS2								14
BCCS3						1		7
BCCS4								25
BCCS5					1			21
BCCS6								11
BCCS7					3			20
BCCS8					1			48
BCCS9					6	2		498
BCCS11								5
BCCS12						1		49
BCCS13								1
BCCS14								2
BCCS15	1							13
BCCS16							1	41
BCCS18	1			2				25
BCCS19	1				1			25
BCCS20								10
BCCS21	1	1	1		7	8		819
BCCS23					1			53
BCCS25								7
BCCS26								6
BCCS27	1							7
BCCS28					1	2		209
BCCS29			1		2			66
BCCS31					1			23
BCCS32					1			6
BCCS33								9
BCCS34								3
BCCS35								6
BCCS37					1			10
BCCS38					1			179
BCCS39								9
BCCS40								5
BCCS41	1				1	7	2	425
BCCS42								14
BCCS43					3	2		44

Table 29: Helena Component MANA Units and Associated Artifacts (con't)

Mana Designation	Projectile Point/Preform	Graver	Spokeshave	Endscraper	Biface	Core	DEF/M	Debitage
BCCS44					1	1		102
BCCS45								5
BCCS46				1		1	1	164
BCCS47							1	8
BPCCS2								5
BPCCS5						1		50
CCCS1					1			182
CCCS2	1				1	1	2	558
CCCS3	3				4			752
CCCS4								17
CCCS5								37
CCCS6					2	2		83
CCCS7	1				9	6	1	783
CCCS8		1						168
CCCS9								102
DAC1	1				5		1	79
GBCCS3								5
GBCCS5						2		43
GBCCS6								1
GBCCS9								28
GBCCS11						1		5
GBCCS13								2
GBCCS14								6
GBCCS15								1
GBCCS16								3
GBCCS17								1
GBCCS18	2	1			2		1	456
GBCCS19	1							3
GBCCS20					5	2		121
GBCCS21								3
GBCCS26								4
GBCCS28								3
GBCCS31								4
GBCCS36	1					1		22
GBCCS38								70
GBCCS39								35
GBCCS41					1			5
GBCCS66								33
GRAN1a								2
GRAN5								16
OBS1	1				1		2	6
OBS2	1							12
OQTZ2								1
QTZCRY1								1
RCCS1								7
RCCS2	1				3	1	1	51

Table 29: Helena Component MANA Units and Associated Artifacts (con't)

Mana Designation	Projectile Point/Preform	Graver	Spokeshave	Endscraper	Biface	Core	DEF/M	Debitage
RCCS3					4			157
RCCS4								151
RCCS5							1	28
RCCS6				1				178
RCCS7								11
RCCS8							1	19
RCCS9								6
RCCS11								43
RCCS12					1			76
RCCS13						1		22
RCCS14					1			12
RCCS15					1			1
RCCS16								15
RCCS17					1			2
RCCS18								4
RCCS19					3			256
RCCS20								1
RCCS21								61
RCCS22								17
RCCS23								2
RCCS24								5
RCCS25								1
RCCS26					1			26
RCCS27								14
RCCS29								1
RCCS30								8
RCCS31						1		5
RCCS32					1			81
RCCS33								21
RCCS34								2
RCCS35								1
RCCS37								6
RCCS47								45
RCCS48					1	1		232
RCCS56								5
RHY2	1							0
SDQZT1b					1			0
SDQZT2a								2
SDQZT4b						1		0
SDQZT4m							1	0
SDQZT5a					1			0
SDQZT5f	1							0
SDQZT5k								6
WCCS1								6
WCCS2								10
WCCS3								6

Table 29: Helena Component MANA Units and Associated Artifacts (con't)

Mana Designation	Projectile Point/Preform	Graver	Spokeshave	Endscraper	Biface	Core	DEF/M	Debitage
WCCS4								9
WCCS5				2			1	256
WCCS6								2
WCCS7								5
WCCS8								8
WCCS9								2
WCCS10								5
WCCS11								9
WCCS12								2
WCCS13								4
WCCS14							1	4
WCCS15								64
WCCS16				1				5
WCCS17								6
WCCS18								23
WCCS19						1		1
YBCCS1a						2	1	178
YBCCS1b								12
YBCCS1c								1
YBCCS1d					4		1	69
YBCCS1e								18
YBCCS2								12
YBCCS3					1	1		10
YBCCS4					1	2	3	232
YBCCS5								27
YBCCS6								9
YBCCS7								6
YBCCS8	1							18
YBCCS9	1							67
YBCCS11								3
YBCCS12								17
YBCCS14								2
YBCCS15								8
YBCCS16								2
YBCCS17								1
YBCCS18	1				2	2		47
YBCCS21								22
YBCCS22								23
YBCCS23								16
YBCCS24								13
YBCCS25								1
YBCCS27								2
YBCCS28						1		3
YBCCS29								2
YBCCS30								197
YBCCS31								54

Table 29: Helena Component MANA Units and Associated Artifacts (con't)

Mana Designation	Projectile Point/Preform	Graver	Spokeshave	Endscraper	Biface	Core	DEF/M	Debitage
YBCCS32								4
YBCCS33a								20
YBCCS33b					1			18
YBCCS34								1
YBCCS35						1	1	16
YBCCS36								13
YBCCS37								15
YBCCS38								25
YBCCS39								3
YBCCS40	1				3			76
YBCCS41	1							10
YBCCS42						1		5
YBCCS43					1			6
YBCCS44								3
YBCCS45					1			16
YBCCS46					1			2
YBCCS47								1
YBCCS48								4
YBCCS49								4
YBCCS50					1	1		111
YBCCS51						1		60
YBCCS52								11
YBCCS53								6
YBCCS54								1
YBCCS55	1							8
YBCCS56								3

Table 30: MANA Units Represented and Corresponding Depths

MANA Unit	Excavated depths below present ground surface where MANA Unit is represented	MANA Unit	Excavated depths below present ground surface where MANA Unit is represented
AND2	150-160cm	BCCS12	0-50cm, 160-200cm
BAS1	105-120cm	BCCS13	70-80cm
BCCS1	0-30cm, 60-90cm, 180-200cm	BCCS14	0-20cm
BCCS2	0-110cm, 131-160cm, 180-200cm	BCCS15	20-50cm, 60-110cm
BCCS3	0-20cm, 40-75cm, 160-200cm	BCCS16	0-45cm, 70-80cm, 90-100cm, 120-140cm,
BCCS4	0-110cm, 160-200cm	BCCS17	20-40cm
BCCS5	0-60cm, 80-100cm, 95-120cm	BCCS18	0-20cm, 30-105cm, 120-130cm, 170-180cm
BCCS6	0-90cm, 105-160cm	BCCS19	0-90cm, 130-200cm
BCCS7	0-45cm, 60-70cm, 160-200cm	BCCS20	0-50cm, 130-140cm, 150-160cm
BCCS8	0-100cm, 140-160cm	BCCS21	0-210cm
BCCS9	0-105cm, 140-200cm	BCCS23	0-100cm, 120-140cm, 160-200cm
BCCS11	0-10cm, 20-40cm, 160-200cm	BCCS24	105-120cm

Table 30: MANA Units Represented and Corresponding Depths (con't)

MANA Unit	Excavated depths below present ground surface where MANA Unit is represented	MANA Unit	Excavated depths below present ground surface where MANA Unit is represented
BCCS25	15-40cm, 60-80cm, 180-200cm	GBCCS18	0-200cm
BCCS26	0-20cm, 180-200cm	GBCCS19	0-60cm
BCCS27	0-40cm, 60-70cm, 100-120cm, 140-160cm	GBCCS20	0-150cm, 180-190cm
BCCS28	0-210cm, 260-280cmBD?	GBCCS21	15-30cm, 180-200cm
BCCS29	0-200cm	GBCCS26	0-30cm
BCCS31	0-50cm, 60-90cm	GBCCS28	30-40cm
BCCS32	0-50cm, 105-120cm, 140-160cm	GBCCS31	0-15cm
BCCS33	0-10cm, 20-30cm, 100-110cm	GBCCS36	0-80cm, 130-140cm, 160-170cm
BCCS34	20-40cm, 100-110cm	GBCCS38	0-90cm
BCCS35	20-40cm, 60-70cm	GBCCS39	0-110cm, 131-180cm
BCCS36	160-180cm	GBCCS41	20-40cm
BCCS37	0-40cm, 60-90cm	GBCCS42	10-15cm
BCCS38	0-80cm, 90-110cm, 120-200cm	GBCCS43	130-140cm, 190-200cm
BCCS39	0-20cm, 30-60cm	GBCCS66	0-80cm
BCCS40	0-30cm, 40-60cm	GRCCS1	128cm
BCCS41	0-200cm	GRAN1a	80-100cm
BCCS47	0-15cm, 30-70cm, 180-200cm	GRAN3	150-160cm
BPCCS2	0-20cm, 50-60cm, 80-100cm, 150-160cm	GRAN5	0-200cm
BPCCS5	0-120cm, 140-200cm	OBS1	0-100cm
CCCS1	0-160cm, 180-200cm	OBS2	0-75cm
CCCS2	0-200cm	OQTZ2	30-40cm
CCCS3	0-200cm	QTZCRY1	0-15cm, 120-130cm
CCCS4	0-70cm, 110-140cm	QTZCRY2	30-45cm, 190-200cm
CCCS5	0-105cm, 150-160cm	RCCS1	15-80cm
CCCS6	0-130cm, 150-180cm	RCCS2	0-105cm, 160-200cm
CCCS7	0-240cm	RCCS3	0-200cm
CCCS8	0-160cm, 190-200cm	RCCS4	0-200cm
CCCS9	0-100cm, 140-190cm	RCCS5	0-100cm, 180-200cm
DAC1	0-90cm, 120-130cm	RCCS6	0-130cm, 150-200cm
GBCCS3	20-45cm, 180-200cm	RCCS7	0-45cm, 80-90cm
GBCCS5	0-60cm	RCCS8	0-100cm, 110-140cm, 160-180cm
GBCCS6	0-20cm, 60-90cm	RCCS9	15-80cm 140-160cm
GBCCS9	20-40cm, 60-80cm	RCCS11	0-70cm, 100-140cm, 160-180cm
GBCCS10	180-200cm, 260-280cmBD?	RCCS12	0-200cm
GBCCS11	0-20cm, 45-60cm, 120-140cm, 180-200cm	RCCS13	0-90cm, 160-180cm
GBCCS12	Surface, 30-40cm, 170-190cm	RCCS14	0-80cm, 120-160cm
GBCCS13	0-15cm, 30-45cm, 180-200cm	RCCS15	15-30cm, 180-200cm
GBCCS14	20-60cm, 130-140cm	RCCS16	0-50cm, 80-90cm, 110-140cm, 180-200cm
GBCCS15	15-30cm	RCCS17	20-40cm
GBCCS16	0-45cm, 140-160cm	RCCS18	0-30cm
GBCCS17	0-10cm, 180-190cm	RCCS19	0-200cm, 180-200cm

Table 30: MANA Units Represented and Corresponding Depths (con't)

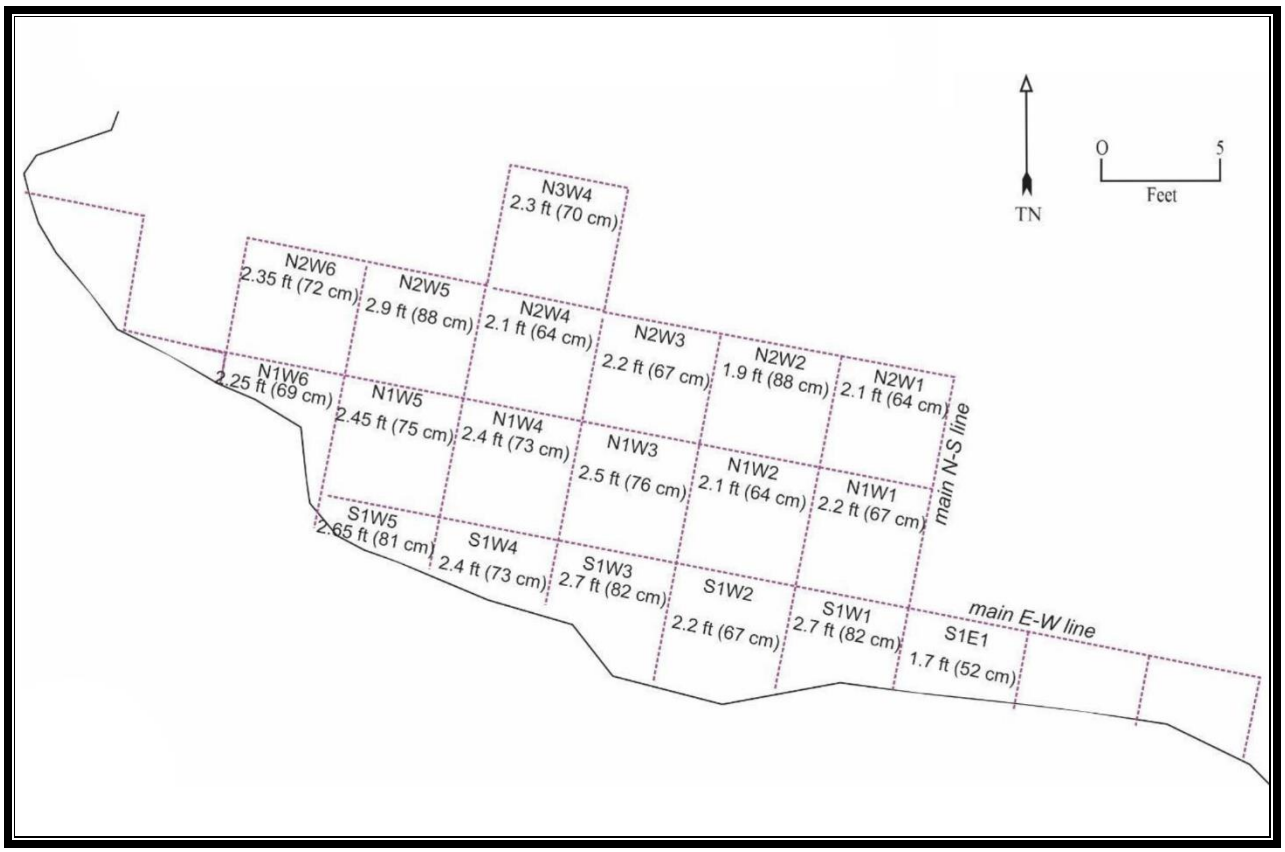
MANA Unit	Excavated depths below present ground surface where MANA Unit is represented	MANA Unit	Excavated depths below present ground surface where MANA Unit is represented
RCCS20	0-10cm, 90-105	WCCS8	0-40cm, 87-90cm, 110-140cm
RCCS21	0-60cm, 75-90cm	WCCS9	60-80 BD?
RCCS22	0-60cm, 90-130cm, 160-190cm	WCCS10	0-30cm, 40-60cm, 120-130cm, 160-180cm
RCCS23	0-15cm, 40-50cm	WCCS11	0-40cm, 80-180cm
RCCS24	0-30cm, 40-60cm	WCCS12	90-140cm, 180-200cm
RCCS25	40-50cm	WCCS13	20-60cm
RCCS26	0-125cm, 120-210cm	WCCS14	10-40cm, 80-100cm, 160-180cm
RCCS27	10-75cm, 90-170cm	WCCS15	0-80cm, 110-140cm, 180-200cm
RCCS28	180-200cm	WCCS16	0-30cm, 50-80cm
RCCS29	20-40cm, 75-90cm	WCCS17	0-30cm, 40-60cm
RCCS30	0-20cm, 160-180cm	WCCS18	0-50cm, 70-100cm, 120-130cm, 140-160cm
RCCS31	0-10cm, 40-80cm, 131-160cm	WCCS19	20-30cm
RCCS32	0-90cm, 110-150cm, 170-190cm	YBCCS1a	0-105cm, 120-140cm, 180-200cm
RCCS33	0-110cm, 130-160cm, 190-200cm	YBCCS1b	0-40cm, 70-100cm, 130-200cm
RCCS34	0-20cm, 60-70cm	YBCCS1c	40-60cm
RCCS35	15-30cm, 90-105cm	YBCCS1d	0-140cm, 170-200cm
RCCS37	10-20cm, 45-60cm	YBCCS1e	0-90cm
RCCS47	0-90cm, 150-200cm	YBCCS2	0-60cm, 75-90cm, 120-130cm, 180-200cm
RCCS48	0-200cm	YBCCS3	15-45cm, 60-80cm, 140-180cm
RCCS56	15-30cm, 60-70cm, 160-180cm	YBCCS4	0-200cm
RHY2	160-180cm	YBCCS5	0-90cm, 105-120cm, 140-160cm
SDQZT1b	40-50cm	YBCCS6	0-20cm, 30-40cm, 70-80cm, 90-100cm
SDQZT2d	99-100cm	YBCCS7	15-40cm, 50-70cm, 90-123cm, 150-160cm
SDQZT2f	149cm	YBCCS8	0-80cm, 100-110cm, 120-140cm, 180-200cm
SDQZT4b	30-40cm	YBCCS9	0-45cm, 85-94cm, 160-200cm
SDQZT4e	67cm	YBCCS11	0-15cm, 30-50cm, 80cm, 170-200cm
SDQZT4m	9-12cm, 200-210cm	YBCCS12	0-45cm, 80-160cm, 180-200cm
SDQZT5a	0-9cm	YBCCS14	30-40cm
SDQZT5e	110-140cm	YBCCS15	0-50cm, 100-120cm, 150-180cm, 200-200cm
SDQZT5f	60-70cm	YBCCS16	20-30cm
SDQZT5j	200-210cm	YBCCS17	20-30cm
SDQZT5k	0-20cm, 70-100cm	YBCCS18	0-30cm, 40-80cm, 100-130cm, 160-200cm
SLM1	180-190cm	YBCCS19	180-200cm
SLM4	84cm	YBCCS21	0-90cm, 180-200cm
WCCS1	0-80cm, 140-160cm	YBCCS22	0-50cm, 140-180cm
WCCS2	0-45cm, 60-80cm	YBCCS23	0-30cm, 60-80cm, 90-120cm, 180-200cm
WCCS3	0-30cm, 160-170cm	YBCCS24	0-60cm, 75-100cm, 180-200cm
WCCS4	0-60cm, 100-110cm, 140-200cm	YBCCS25	40-60cm, 180-200cm
WCCS5	0-210cm	YBCCS27	45-60cm, 90-105cm, 180-200cm
WCCS6	15-30cm, 60-80cm	YBCCS28	0-20cm, 105-140cm, 160-180cm
WCCS7	0-20cm	YBCCS29	0-30cm, 110-160cm, 180-200cm

Table 30: MANA Units Represented and Corresponding Depths (con't)

MANA Unit	Excavated depths below present ground surface where MANA Unit is represented	MANA Unit	Excavated depths below present ground surface where MANA Unit is represented
YBCCS30	0-100cm, 110-200cm	YBCCS43	30-50cm, 160-200cm
YBCCS31	0-60cm, 75-90cm, 180-200cm	YBCCS44	20-30cm, 120-130cm
YBCCS32	20-50cm	YBCCS45	20-45cm, 60-80cm, 105-200cm
YBCCS33a	0-60cm, 75-90cm, 180-200cm	YBCCS46	0-30cm, 110-120cm
YBCCS33b	0-50cm, 80-90cm	YBCCS47	15-30cm
YBCCS34	0-20cm	YBCCS48	15-30cm, 45-70cm, 90-100cm
YBCCS35	0-90cm, 170-200cm	YBCCS49	10-20cm, 40-50cm, 80-100cm, 180-200cm
YBCCS36	10-60cm, 70-80cm	YBCCS50	0-120cm, 140-200cm
YBCCS37	15-45cm, 60-75cm, 180-200cm	YBCCS51	0-140cm
YBCCS38	0-30cm, 40-70cm	YBCCS52	0-50cm, 70-80cm, 90-135cm, 150-160cm, 180-200cm
YBCCS39	0-10cm, 30-70cm, 180-200cm	YBCCS53	0-20cm, 30-45cm, 75-90cm
YBCCS40	0-140cm, 180-200cm	YBCCS54	30-40cm, 105-120cm
YBCCS41	20-100cm	YBCCS55	0-10cm, 190-200cm
YBCCS42	0-30cm, 60-70cm, 110-140cm, 170-200cm		

APPENDIX 4

Vertical Distribution of Artifacts and Cultural Components



MacHaffie Site (24JF4)
Forbis 1951 Excavation Grid

Artifact depth calculation established by Rennie based on NE corner stake top surface elevations and ground surface mean elevations provided by Forbis (1955:57)

24JF4: Folsom Artifact Depths as Documented by Forbis (1955:56-95)

Record #	Excavation Unit	Forbis Artifact No.	Artifact Type	Depth Below Datum (ft) (Forbis 1955: 56) [Figure 4]	Corrected Depth Below Datum (ft) (Forbis 1955:58) [Figure 5]	Corrected Depth Below Datum Conversion (cm) (following Forbis 1955:58)	Attempted Depth Below Ground Surface Conversion (cm) following Forbis (1955: 55-58)	Depth in Feet Listed on Original Artifact Bag Label: Metric Conversion (cm) Included Here
30	S1/W1	2002	DEF/M	4.7	5.4	165	83	2.8 (85)
**	N1/W1	1003	Folsom point preform fragment	5	5.8	177	110	3-3.25 (91-99)
91	S1/W3	3005	biface	5.3	5.7	174	92	2.8-3.1 (85-94)
93	S2/W3	1002	biface	5.1	5.4	165	83	2.7 (82)
20	N2/W2	1001	Folsom point preform fragment	5.7	6.4	195	107	4.2 (128)
12	S1/W3	2000	endscraper	5.6	5.9	180	98	2.8-3.2 (85-97)
28	N2/W4	1000	Folsom point fragment	6.6	6.2	189	116	3.2 (97)
95	N2/W3	3006	biface	6.6	7.2	219	152	4.9 (149)
90	N2/W4	3002	biface	6.7	6.5	198	134	4.4 (134)
79	N2/W3	4001	core	6.7	7.2	219	152	4.55 (139)
31	N2/W5	3003	DEF/M	6.8	6.4	195	107	3.5 (107)
89	N2/W4	4003	biface	6.1	6.1	186	122	3.95 (120)
8704	S1/W5	2004	unmodified flake	6.2	5.8	177	96	3.15 (96)
82	S1/W5	4000	core	6.3	5.7	174	93	3.15 (96)
88	S1/W4	5000	biface*	6.4	5.7	174	101	2.85-3.15 (87-96)
94	N1/W6	3000	biface	6.6	6.2	189	120	3.7 (113)
81	N1/W4	4002	core	6.6	6.3	192	119	3.9 (119)
29	N2/W6	3001	DEF/M	7.2	6.1	186	114	3.5-4.0 (107-123)
32	N2/W6	3004	DEF/M	7.3	6.3	192	120	3.8 (116)
92	N2/W8	3007	biface	7.4	6.3	192	125	2.4 (73)
**	N1/W7	2005	DEF/M	7.2	6.3	192	123	3.2 (97)
80	S1/W6	4004	core	7.2	6.4	195	117	3.5-4.0 (107-123)
18	surface	1004	Folsom point preform fragment***	-	-	-	-	-
19	S2/W2	1500	Folsom point fragment	-	-	-	-	2.65-2.95 (80-90)
8703	N2/W6	5002	channel flake	-	-	-	-	3.5-4.0 (107-123)
78	S1/E1	4005	core	-	-	-	-	-

* oriented on end when exposed (Forbis 1955)

** artifact is missing from UM collection

*** artifact collected by June MacHaffie

24JF4: Cody Complex Artifact Depths as Documented by Forbis (1955:56-95)

Record #	Excavation Unit	Forbis Artifact No.	Artifact Type	Depth Below Datum (ft) (Forbis 1955: 56) [Figure 4]	Corrected Depth Below Datum (ft) (Forbis 1955:58) [Figure 5]	Corrected Depth Below Datum Conversion (cm) (following Forbis 1955:58)	Attempted Depth Below Ground Surface Conversion (cm) following Forbis (1955: 55-58)	Depth in Feet Listed on Original Artifact Bag Label: Metric Conversion (cm) Included Here
26	S1/W4	3203	biface	4.6	4.7	143	70	2.4 (73)
64	N1/W4	1210	biface	5.2	5	152	79	2.6 (79)
65	S1/W3	1206	biface	4.7	5.1	155	73	2.35 (72)
66	N2/W4	3217	biface	5.2	4.8	146	82	2.75 (84)
67	S1/W4	3220	biface	5	4.8	146	73	2.4 (73)
69	N1/W2	3210	biface	4.7	4.8	146	82	2.7 (82)
70	S1/W5	3201	biface	5.6	4.8	146	66	2.1 (64)
71	N2/W4	1211	biface	5.1	5.2	158	94	3.05 (93)
72	S2/W2	3218	biface	3.7	4.4	134	67	2.3 (70)
73	N1/W5	3213	biface	5.4	4.8	146	72	2.4 (73)
74	S1/W3	3219	biface	4.8	5.2	158	76	2.4 (73)
75	N1/W5	3209	biface	5.3	4.8	146	72	2.4 (73)
78	N2/W3	3215	biface	4.6	5.1	155	88	2.9 (88)
79	S1/W4	3216	biface	4.7	4.6	140	67	2.2 (67)
80	S1/W3	3200	biface	5.7	5.3	162	79	2.59 (79)
81	N1/W2	4202*	biface	4.8	5.1	155	91	2.95 (90)
83	N1/W3	3208	biface	4.6	5.2	158	74	2.35 (72)
84	N2/W2	3204	biface	3.8	4.1	126	67	2.2 (67)
85	N2/W2	1503	biface	4.2	4.3	131	73	2.45 (75)
86	N1/W4	3221	biface	5.1	5.2	158	85	2.7 (82)
87	S1/W5	3205	biface	5.7	4.9	149	69	2.3 (70)
**	N2/W5	3744	biface	-	-	-	0.7 (21)	-
**	S1/W2	3211	biface	-	-	-	-	-
**	N1/W1	2205	biface	-	-	-	3.1 (94)	-
100	S2/W2	6005*****	biface					2.2-2.7 (67-82)
68	S1/W4	1208A	biface fragment	4.8	4.6	140	69	2.6 (69)
68	N2/W6	1208B	biface fragment	5.6	4.5	137	66	2.1 (64)
68	N1/W5	1208C	biface fragment	5.6	4.8	146	72	2.4 (73)
77	N2/W2	10007	biface***	-	-	-	-	-
**	-	10009	biface***	-	-	-	-	-
**	-	10005	biface***	-	-	-	-	-
76	S1/W4	3207	biface****	4.9	4.8	146	73	2.4 (73)
82	surface	3202	biface****	-	-	-	-	-
**	S1/W4?	3212	biface****	-	-	-	“Yuma Level”	-
**	S1/W4	3224	biface?	3.7	4.3	131	58	-
**	S1/W2	3211	biface?	4.2	4.5	137	70	-
76	S1/W2	4201	core	4.2	4.6	140	73	2.3 (70)
20	S1/W3	5205	DEF/M	4.9	4.9	149	67	2.2 (67)
21	N1/W2	5206	DEF/M	4.9	5.4	165	100	3.4 (100)
22	N1/W2	5204	DEF/M	4.7	5.3	162	98	3.25 (99)
23	N1/W2	4200	DEF/M	4.8	5.3	162	98	3.25 (99)
24	N1/W3	3206	DEF/M	4.6	5.2	158	74	2.35 (72)
25	S1/W2	1205	DEF/M	4.2	4.7	143	76	2.5 (76)

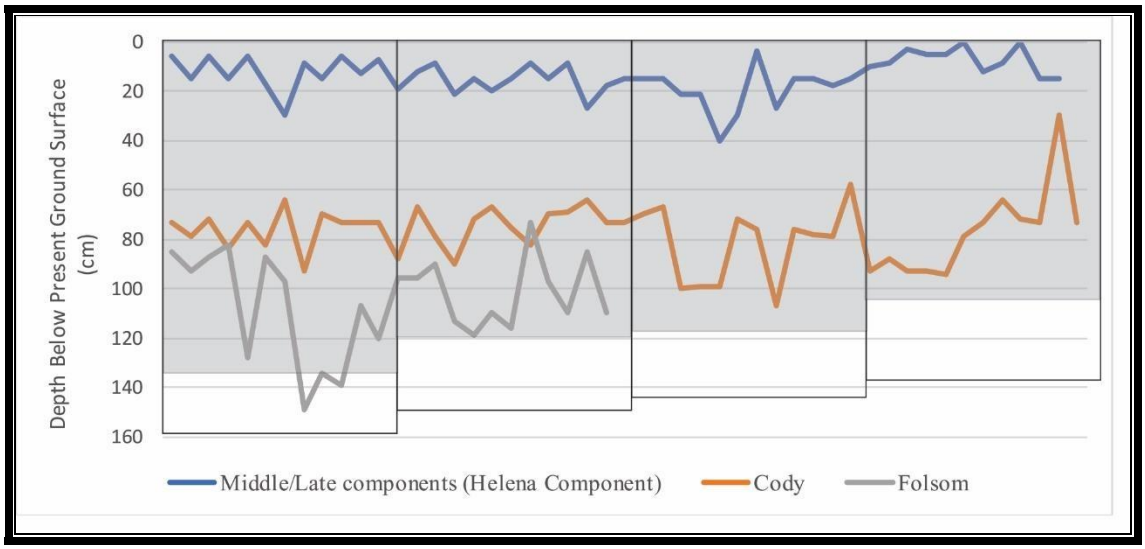
24JF4: Helena Component Artifact Depths as Documented by Forbis (1955:56-95)

Record #	Excavation Unit	Forbis Artifact No.	Artifact Type	Depth Below Datum (ft) (Forbis 1955: 56) [Figure 4]	Corrected Depth Below Datum (ft) (Forbis 1955:58) [Figure 5]	Corrected Depth Below Datum Conversion (cm) (following Forbis 1955:58)	Attempted Depth Below Ground Surface Conversion (cm) following Forbis (1955: 55-58)	Depth in Feet Listed on Original Artifact Bag Label: Metric Conversion (cm) Included Here
27	N1/W4	3214	DEF/M	5.1	5.1	155	73	3.5 (107)
28	N1/W4	3222	DEF/M	5.2	4.8	146	73	2.5 (76)
5	S1/E1	2200	endscraper	-	-	-	2.55 (78) - 2.65 (81)	2.55 (78)
6	S1/W1	2001	endscraper	-	-	-	2.6 (79)	2.6 (79)
7	S1/W5	2206	endscraper	5.6	4.6	140	59	1.9 (58)
8	N1/W1	2203	endscraper	4.8	5.2	158	91	3.05 (93)
9	N1/W2	2202	endscraper	4.9	4.9	149	85	2.9 (88)
10	N1/W1	2003	endscraper	4.9	5.3	162	94	3.05 (93)
10	N1/W1	2003	endscraper	-	-	-	3.85 (117)	3.05 (93)
11	N1/W1	2204	endscraper	4.8	5.3	162	94	3.1 (94)
**	N1/W1	2205	endscraper	4.6	5.3	162	94	-
**	S1/E1	2201	endscraper	-	-	-	2.55 (78) - 2.65 (81)	-
22	S1/W2	1203	Cody point	4.1	4.8	146	79	2.6 (79)
23	S1/W4	1200	Cody point	5	4.8	146	73	2.4 (73)
24	S1/W3	1209	Cody point	4.6	4.8	146	64	2.1 (64)
**29	surface	1212	Cody point****	-	-	-	-	-
**30	N1/W3	1201	Cody point	4.6	4.7	143	67	-
**31	S1/W4	1202	Cody point	5	4.9	149	76	-
21	S1/W3	1204	Cody point base	4.7	5.1	155	73	2.35 (72)
25	surface	1735	Cody point base	-	-	-	-	-
26	S1/W4	1207	Cody point base	4.9	4.8	146	73	2.4 (73)
27	N2/W3	1504	Cody point/knife	-	-	-	-	1.0 (30)
11	S1/W4	5201	shaft abrader	4.9	4.8	146	73	2.4 (73)
33	S1/E1	3743	DEF/M	N/A	N/A	N/A	N/A	0-0.2 (0-6)
32	N1/W7	1707	Hanna point	N/A	N/A	N/A	N/A	0-0.5 (0-15)
33	N2/W3	1731	Hanna point	N/A	N/A	N/A	N/A	0-0.2 (0-6)
34	S1/W1	1718	indeterminate point type	N/A	N/A	N/A	N/A	0-0.5 (0-15)
35	N1/W2	1715	Pelican Lake point	N/A	N/A	N/A	N/A	0-0.2 (0-6)
36	N2/W1	1728	Pelican Lake point	N/A	N/A	N/A	N/A	0.5-0.6 (15-18)
37	N1/W1	1712	Pelican Lake point	N/A	N/A	N/A	N/A	1.0 (30)
38	N1/W3	1714	Pelican Lake point	N/A	N/A	N/A	N/A	0.3 (9)
39	N2/W1	1726	Pelican Lake point	N/A	N/A	N/A	N/A	0.5 (15)
40	N2/W1	1729	Pelican Lake point	N/A	N/A	N/A	N/A	0-0.2 (0-6)
41	N2/W1	1727	Pelican Lake point	N/A	N/A	N/A	N/A	0.4-0.5 (12-15)
42	N2/W1	1724	Pelican Lake point	N/A	N/A	N/A	N/A	0.25 (7-8)
43	N2/W1	1725	Prairie/Plains S-N point	N/A	N/A	N/A	N/A	0.6-0.7 (18-21)

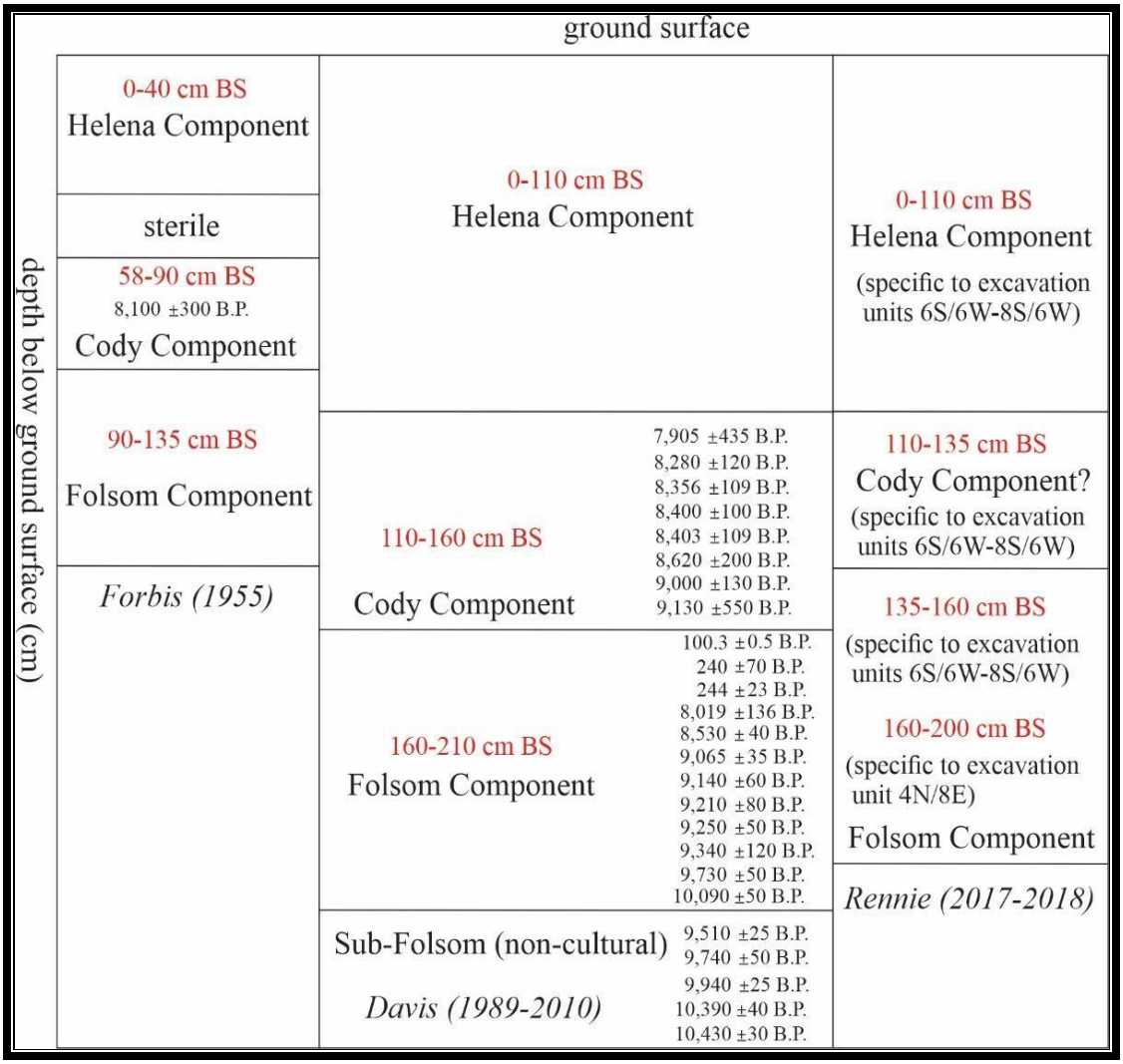
* possibly mislabeled as "4204" in Figure 5 of Forbis' dissertation (Forbis 1955:58)
** artifact is missing from UM collection
*** artifact collected by Carling Malouf
**** artifact collected by Edmund MacHaffie
***** artifact labeled by Ruthann Knudson

24JF4: Helena Component Artifact Depths as Documented by Forbis (1955:56-95)

Record #	Excavation Unit	Forbis Artifact No.	Artifact Type	Depth Below Datum (ft) (Forbis 1955: 56) [Figure 4]	Corrected Depth Below Datum (ft) (Forbis 1955:58) [Figure 5]	Corrected Depth Below Datum Conversion (cm) (following Forbis 1955:58)	Attempted Depth Below Ground Surface Conversion (cm) following Forbis (1955: 55-58)	Depth in Feet Listed on Original Artifact Bag Label: Metric Conversion (cm) Included Here
44	S1/W4	1723	Duncan/Hanna	N/A	N/A	N/A	N/A	0.3-0.4 (9-12)
45	N5/W3	1711	atlatl-size point tip	N/A	N/A	N/A	N/A	0-0.3 (0-9)
46	S1/E4	1701	atlatl-size point tip	N/A	N/A	N/A	N/A	0-0.5 (15)
96	N1/W5	1700	biface	N/A	N/A	N/A	N/A	0.7 (21)
97	N1/W5	3725	biface	N/A	N/A	N/A	N/A	0.5 (15)
98	N1/W7	1710	biface	N/A	N/A	N/A	N/A	0.5-1.0 (15-30)
99	S2/W2	1708	biface	N/A	N/A	N/A	N/A	0-1.0 (0-30)
83	S1/W4	2709	core	N/A	N/A	N/A	N/A	0.3-0.4 (9-12)
84	S1/E6	4708	core	N/A	N/A	N/A	N/A	0.5-1.0 (15-30)
85	S1/W4	4700	core	N/A	N/A	N/A	N/A	0.3-0.4 (9-12)
86	N1/W1	4500	core	N/A	N/A	N/A	N/A	0.9 (27)
87	N2/W5	3746	core	N/A	N/A	N/A	N/A	0.6 (18)
88	N2/W2	4704	core	N/A	N/A	N/A	N/A	0.5 (15)
89	S1/E6	4705	core	N/A	N/A	N/A	N/A	0.5-1.0 (15-30)
90	N2/W2	4707	core	N/A	N/A	N/A	N/A	0.5 (15)
91	N2/W2	4706	core	N/A	N/A	N/A	N/A	0.7 (21)
13	S1/W3	2708	endscraper	N/A	N/A	N/A	N/A	0.7-1.2 (21-36)
14	S1/W1	2500	endscraper	N/A	N/A	N/A	N/A	0.8-1.4 (39-55)
15	N2/W2	2706	endscraper	N/A	N/A	N/A	N/A	1.0 (30)
16	N2/W1	2712	endscraper	N/A	N/A	N/A	N/A	0.1-0.2 (3-6)
17	S1/W3	2702	endscraper	N/A	N/A	N/A	N/A	0.9 (27)
34	S1/E6	1734	DEF/M	N/A	N/A	N/A	N/A	0.5-1.0 (15-30)
35	S1/E6	2718	DEF/M	N/A	N/A	N/A	N/A	0.5-1.0 (15-30)
36	N2/W1	3714	DEF/M	N/A	N/A	N/A	N/A	0.6-0.7 (18-21)
37	N1/W6	3734	DEF/M	N/A	N/A	N/A	N/A	0-0.5 (0-15)
38	N1/W6	2716	DEF/M	N/A	N/A	N/A	N/A	0-0.5 (0-15)
39	S1/W4	3718	DEF/M	N/A	N/A	N/A	N/A	0.3-0.4 (9-12)
40	N2/W2	2711	DEF/M	N/A	N/A	N/A	N/A	0.2-0.3 (6-9)
41	N1/E2	1722	DEF/M	N/A	N/A	N/A	N/A	0-0.1 (0-3)
42	N1/W3	2704	DEF/M	N/A	N/A	N/A	N/A	0.1-0.2 (3-6)
43	N1/W4	2720	DEF/M	N/A	N/A	N/A	N/A	0.1-0.2 (3-6)
8706		1105	debitage	N/A	N/A	N/A	N/A	0 (0)
8707	N1/W5	2701	debitage	N/A	N/A	N/A	N/A	0.4 (12)
8708	N5/W3	2707	debitage	N/A	N/A	N/A	N/A	0-0.3 (0-9)
8709	N1/W5	4701	debitage	N/A	N/A	N/A	N/A	0 (0)
8710	N1/W5	3705	debitage	N/A	N/A	N/A	N/A	0-0.5 (0-15)



Vertical piece plotting of artifacts and proveniences as reported by Forbis (1955).



Comparison of Forbis, Davis and Rennie cultural component depths.

Units 2000-C, 96 West Test 6S/4W, 6S/6W, 8S/4W, and 8S/6W combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-10		1		10		553	1		3						1	
10-20		6				237				1						
20-30		4	7	3		380										
30-40			1	2		213									1	
40-50			9	1		279	1			1			1			
50-60		1				166						3				
60-70			3	7		160	1									
70-80			15	1		147			1							
80-90				1		163										
90-100			12	1		78							1			
100-110						121	1					1				
110-120		1	2			67										
120-130			4			79										
130-140			12			126										
140-150		1	30			607						2				
150-160			4			268									1	
160-170			23	2		22							2			
170-180		2		3		189							1			
180-190			22			68										
190-200				1		50					1		1			
200-210						7										
210-220													1			

2001 Block Excavation Units: C1 - C9 combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-80+	Sediments stripped and not examined															
80-100						4										
100-110																
110-140						33							1			
131-160			22			79						1	1			
160-180		1	79	3		166	2									
180-200			79	6		2,660						1	1	1		
200-220			62			54							1			

Forbis 1951 Block Excavation Units: N1/E2, N1/W1-N1/W7, N2/W1-N2/W8, N3/W4, N5/W3, S1/E1-S1/E6, S1/W1-S1/W6, and S2/W2-S2/W5 combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-15		19	3	5		1,701	9	2							15	
15-30		19	16	8		1,160	4	2							2	
30-45		3	6	1		598		1							1	1
45-60	1	1	103			641		2							2	
60-75		17	68	4		2,440	5								4	
75-90		11	67	1		529	2	4							2	
90-105		1	14			250	5	3	1						1	
105-120		4	16	4		43	3								1	
120-135		1	26			3										
135-150		1		1												

2000-4 Excavation Unit

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20						3										
20-40						12										
40-60						5										
60-80						18										
80-100																
100-120																
120-140																
140-160																
160-180				8	1											
180-200			1			3										

2000-5 Excavation Unit

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20				1		136							1		1	
20-40						100										
40-60						5										
60-80						5										
80-100						14										
100-120						3										
120-140						4										

2000-6 Excavation Unit

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20																
20-40						4	1									
40-60						1										
60-80						2	1									
80-100						2										
100-120			1			2										
120-140						8										
140-160						5										
160-180																
180-200		1		2		11				1						

Unit 2 Excavation Units: 14S/2E and 16S/2E combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-10			5	1		26										
10-20		1				34										
20-30		1				66										
30-40		1	1	1		49		1								
40-50			2			54										
50-60			1			46										
60-70						26										
70-80						24										
80-90						16										
90-100			2			44										
100-110						64										
110-120						172										
120-130						25										
130-140						8										

Trench A/1989 Trench, 98 South Block, 2008-SBE, 2000-A, 6S/2W, and 8S/2W
Excavation Units: 4N/0E, 2N/0E, 0N/0E, 2S/0E, 3S/0E, 4S/0E, 6S/2W, 8S/2W, 4S/2E, 4S/4E, 6S/2E, 6S/4E, 2008-SBE, and 2000-A combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-10		3	6	1		238	2		4				2			
10-20		1	46	1		381	1								1	
20-30		3	31	3		414	1						41		1	
30-40		2	51	2		361				1			1		2	
40-50		6	23	2		137										
50-60		3	1	1		115							2		1	
60-70		1	2	1		72									1	
70-80		2				73	1									
80-90			2			11										
90-100			2			18										
100-110						22										
110-120			3	2		22										
120-130						18										
130-140		2	1			11										
140-150		1	14	1		66										
150-160		1	39			80	3	3							1	
160-170	1	2	39	1		29										
170-180		1	15			72									1	
180-190		4	26	3		334										
190-200			1	1		77										
200-210			2			31										
210-220			23			1										

Unit 2000-B

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20				3		232	2									
20-40				1		171										
40-60						165									1	
60-80		2				126										
80-100		2	18			68										
100-120						19										
120-140						11										
140-160						7										
160-180						14										
180-200				1		6										

Units 4N/8E and 6N/8E combined

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-170	Sediments may have been stripped without further examination															
170-180									1							
180-190				2		18			80							
190-200						23			35							
200-210			89			17										

Test C

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20			38										8			
20-40			12													
40-60			29													
60-80			44													
80-100			7													

TU-1

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-20			1			16										
20-40			2	1		38							1			
40-60						12										

Unit 1

Level (cm BS)	Abrader	Biface	Bone	Core	Cultural Stone	Debitage	DEF/M	Endscraper	FCR	Graver	Hammerstone	Hematite Nodule	Historic Item	Notched Flake	Projectile Point	Quartz Crystal
0-10						82	1						13			
10-20						69										
20-30				1		77										
30-40						11										
40-50						5									2	
50-60						29										

Appendix 5

Glossary of Terms

***Assemblage**:*

a group of artifacts in a site associated with a single unit of study, generally a defined archaeological culture.

***Bifaces**:*

flaked stone pieces characterized by moderate to complete modification and shaping as a result of bifacial-flaking. Following Whittaker (1994:202), a Stage I biface refers to an edged blank. In this initial stage of biface manufacture, a piece of lithic raw material (typically a large flake, flattish cobble, or tabular piece) is edged by the removal of flakes around the perimeter of the blank. This is typically accomplished by removing a flake from the edge of the blank toward the centerline on one surface, then inverting the piece and removing a flake from the opposite surface of the same edge. Most Stage I bifaces have wavy edges, are fairly thick (width is about twice the thickness) and have steep edge-angles between 50 and 80 degrees. A Stage II biface refers to a piece of lithic raw material that has been initially edged and shaped and has undergone partial or complete primary thinning through the removal of major ridges and irregularities (flakes have been removed which cut across the surfaces of the piece). A Stage II biface can exhibit a wide range of cross-section shapes with moderately straight and centered edges. The edges typically exhibit steep angles which fall between 60 and 40 degrees.

Further, a Stage II biface is typically three to four times as wide as it is thick, and it is generally considered to exhibit the highest ratio of break resistance to portability in the bifacial reduction sequence. Stage II bifaces are referred to as preforms or quarry blanks because they are commonly found at tool-quality stone quarry and collection sites. A Stage III biface is generally defined by Whittaker (1994: 203) as a refined biface. During Stage III reduction, flakes are further removed across the biface surfaces in an effort to considerably thin the artifact and flatten the cross section. Completed Stage III bifaces should exhibit width/thickness ratios of 4.00 or greater and edge angles that fall between 25 and 45 degrees. Similar to Stage II bifaces, however, refined bifaces lack a specified shape. Callahan (1979:116) refers to this phase in the reduction sequence as Stage IV but also uses the terms “trade blanks” or “cache blanks”, because caches of such refined bifaces have been discovered throughout the New World. It should be noted that Whittaker’s (1994) Stage II and Stage III biface descriptions largely correspond with Callahan’s Stage III and Stage IV categories (Callahan 1979). Either Callahan’s or Whittaker’s reduction scheme is acceptable. Choosing one over the other is a matter of personal preference. The primary weakness in both is the subjectivity of classifying intermediate stages of bifaces that exhibit characteristics of sequential stages of production. Bifaces are described herein as to reduction stage, shape, and condition. Structural problems, as well as evidence of use or transport wear and intentional retouch, are also noted. Bifaces identified herein typically served as preforms or cutting and scraping tools. Although projectile points and some cores can be bifacially flaked

implements, they are placed within discrete formal tool categories for purposes of this study based on presumed function.

***Burin/Graver**:*

a piece of culturally modified stone with an intentionally produced chisel-like or short, pointed projection probably used for engraving, incising, or carving wood, bone, or soft stone.

***Collection**:*

the totality of cultural materials from a site that are stored off-site for academic study.

***Complex**:*

a group of traits, usually tool types or styles, associated with each other through time and over a defined geographic area. These traits also show stylistic artifact and feature type differences from other trait groups.

***Component**:*

a stratigraphic layer within a site that appears to contain the remains of a definable archaeological culture during a relatively brief period of time, even if multiple intermittent occupation episodes are present.

***Cores**:*

stones utilized for the intentional production of flakes. Byproducts of core preparation and intentional flake removal consist of inadvertently generated flakes as well as dust and shatter. Cores exhibiting evidence of use as implements such as choppers or scraper planes are referred to as core tools. The presence of cores in a site is typically inferred to reflect flake blank production.

***Debitage with Edge-Flaking/Modification (DEF/M)**:*

flakes and shatter that: (1) exhibit a series of secondary flake scars along one or more edge of the piece; or (2) exhibit edge-rounding and polish, attributed to repeated scraping or rubbing.

The category of DEF/M includes pieces commonly referred to by other researchers as marginally retouched stone tools, utilized flakes, side scrapers, and retouched flakes. Excluded are the more formal shaped tool categories such as bifaces, endscrapers, drills, awls, gravers, denticulates, and spokeshaves, even though formal tools may exhibit intentional or incidental retouch. For DEF/M, the edge modification, is generally limited in extent and has not resulted in major modification to the piece. Edge modification is not always intentional. Sometimes a series of small flake removals from the edge of a piece can form incidentally during flake production, especially through platform-edge abrading. Similar small flake removals can also incidentally occur during use of the flake as a simple cutting or scraping implement. Because the resulting edge damage of these two processes

can be difficult to distinguish the unintentional modification is typically referred to as "use-wear." Additionally, edge-battering during transport or post-depositional processes can produce pseudo-retouch (Tringham et al. 1974) but the frequency of this occurring is questionable (see Rennie 2004). Alternately, edge modification can be intentionally generated through preparation of a tool's edge (pressure retouch) or rejuvenation (resharpening) of a dulled edge (cf. Odell and Odell-Vereeken 1980).

***Distal**:*

in stone tool analysis is a term used interchangeably with "tip" or to describe the margin closest to the most-narrow end of a biface. In debitage analysis the term implies the margin longitudinally farthest from the platform. For hafted artifacts, the term describes the part of the artifact which is longitudinally farthest from the proximal margin or hafted end.

***Drills/Awls/Perforators**:*

culturally modified stone with an intentionally produced (generally fully pressure flaked) projection that tapers to a point. These are believed to have been used for drilling into, or otherwise perforating hide, leather, wood, bone or stone.

***Endscrapers**:*

in their basic form consist of a steep, uniformly retouched working edge located at one end of a flake. They can be thick and plano-convex in profile, or they can be made on rather thin, flat flakes. Extensive ethnographic evidence and archaeological research indicate endscrapers primarily served to scrape and soften animal hides. Endscrapers are described as to type, condition and whether evidence of use-wear or retouch is present

***Faunal remains**:*

typically represented by animal skeletal remains. Faunal remains from archaeological sites are generally interpreted to reflect cultural procurement and utilization of animal products such as meat, hide, bone, horn, antler, sinew and marrow. Faunal remains form a major database from which inferences on resource utilization patterns and site seasonality are based. As a side note, some faunal remains in archaeological sites are not derived from nor related to, the cultural activities that took place in a site (e.g., the remains of a rodent that burrowed into a site and died within its burrow).

***Feature**:*

refers to "any phenomena of which the excavator wants to keep track (Brumley 1981)". When designated as such, a feature is assigned a reference number and it is described by type. Metric and nonmetric data are collected and its provenience is also recorded.

Firecracked rock (FCR):

is stone which:

1) fractured as a result of being heated;

2) fractured as a result of being heated and rapidly cooled (i.e., submersed in water); or
3) fragmented during heating, rapid cooling, or sometime after cooling, along fractures which were produced either when the stone was heated or rapidly cooled.

Firecracked rock is generally interpreted to reflect past heating or cooking activities. Some lithic raw material used to produce stone tools was intentionally heated to improve knappability. If heat was not well controlled or heated pieces experience a sudden drop in surface temperature, those materials can exhibit heat crazed and heat spalled (potlid) fractures or burned cortical surfaces (Eugene Gryba pers. comm. 2020). Lithic materials identified for this study as damaged through thermal alteration geared at improving knappability are not considered firecracked rock. They are placed within the context of heat-treated materials used to produce chipped stone tools.

Three fracture types among FCR are recognized (Rennie 2001):

1) **Water fractured** (see illustration): Fracture lines tend to appear sinuous or jagged when viewed at an angle 90° to the fracture plane surface. Fracture plane surfaces tend to appear rough and undulating. Pieces tend to be blocky, not thin and flake-like. This fracture pattern is generally forms as a result of stone boiling where heated stones crack while immersed in water.

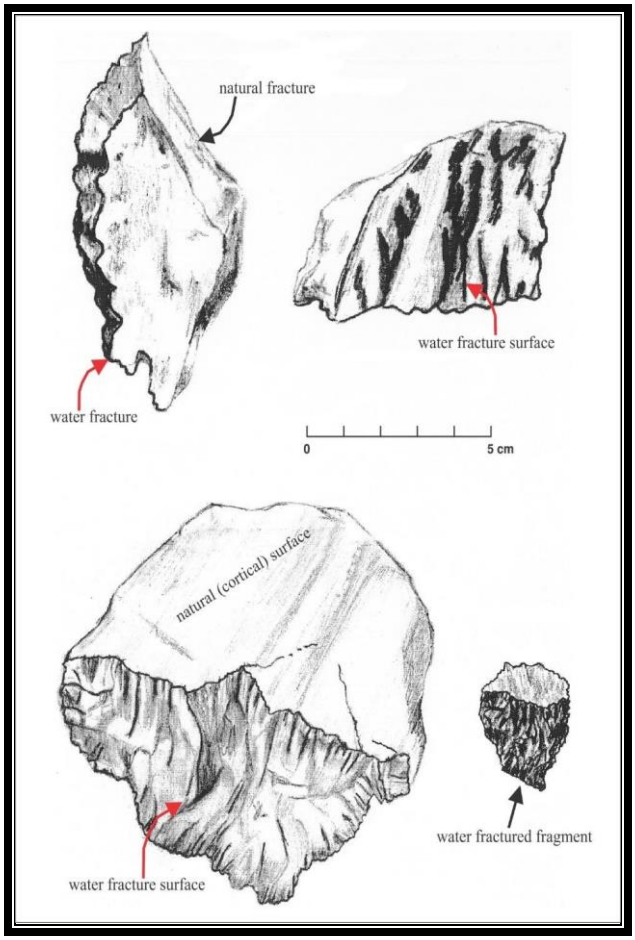


Illustration of Experimental Water Fracture-Type Firecracked Rock.

2) **Heat spalled** (see illustration): Fracture lines tend to appear straight, concave, or convex. In profile, fracture plane surfaces tend to appear generally uniform, never severely undulating. Additionally, heat spalled fracture tends to produce generally straight edges that continue for long stretches without being interrupted by perpendicular fractures. Heat spalled pieces can superficially resemble flakes or amorphous flake core surfaces but do not exhibit evidence of flake manufacture such as platforms, bulbs of percussion or radial lines. Heat spalled/fractured pieces include:
    a. thin, flake-like pieces such as potlids and exfoliated pieces of the surface of the stone that was heated;
    b. thicker pieces such as removed edges of cobbles or fragments which followed along pre-existing or developmental flaws or fractures; and
    c. pieces that exhibit generally smooth and straight edged negative fracture or exfoliated surfaces. Heat spalled fracture type presumably forms while stone is being heated. It forms less frequently when a heated stone is submersed in water.

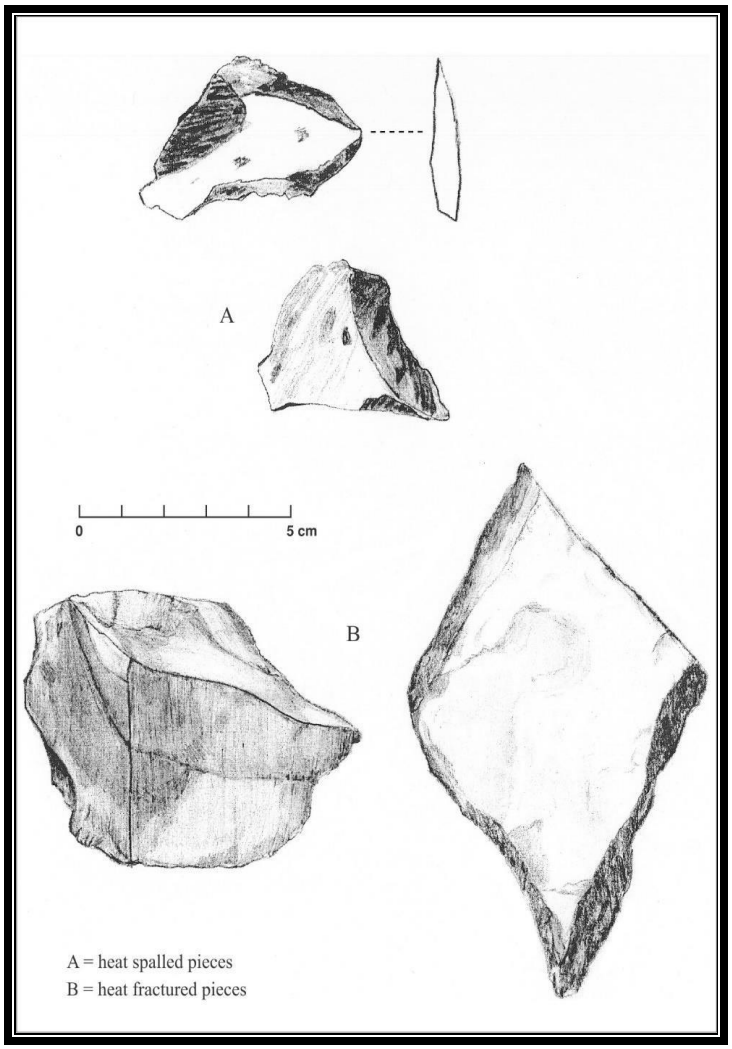


Illustration of Experimental Heat Spalled Fracture-Type Firecracked Rock.

3) **Indeterminate**: Fracture lines and surfaces are not distinctively heat spalled or water fractured.

Hammerstones:

usually palm-size or larger stones showing evidence of use as a hammer, commonly a battered end. *Anvil stones* are similar except the battered and crushed areas are open surfaces where it appears objects were positioned while being struck. Hammerstones and anvils were used in chipped stone tool production, and plant and animal processing.

Heat-treating:

in its ideal sense, is the process of slowly heating raw stone, which is intended for use in flaked stone tool production, to a high enough temperature for a time long enough to make the stone less grainy and more brittle. Heat-treating improves knapping qualities of some microcrystalline and crypto-crystalline silicates, but the process may work with other kinds of fine-grained stone as well. In addition to changing the texture of the stone, heat-treating often causes some materials to darken or change color. Yellowish colored chert tends to turn red through oxidation of iron within the silica matrix. It also tends to produce a pinkish cast or isolated pinkish areas in white to beige colored chert (Rennie n.d.a.; Whittaker 1994:73). However, because red chert occurs naturally, it is difficult to distinguish heat-treated materials by color alone. Texturally, successfully heat-treated, highly siliceous materials tend to exhibit a glossy appearance and have a smooth, soapy feel.

Proximal:

used interchangeably with "base". It describes the margin farthest from the tip of a pointed artifact. For hafted artifacts, the term describes the hafted end of the artifact. In debitage analysis, the term implies the striking platform margin. In faunal analysis, the term is used to describe the point or portion of the skeletal element (specifically the leg bones) which is closest to the spinal column in its articulated position.

Spokeshave:

a chipped stone tool used to shape and smooth wooden rods and shafts. It is typically identified by a shallow and broad concavity that has been pressure flaked into the edge of a reasonably thin flake or bifacially worked implement.

Stone boiling:

a process of heating water within a container by adding heated stones. The heated water is then used in cooking, rendering, softening or processing animal or plant materials.

***Typology**:*

following Lahren and Sorrells (1970: 47) is an "Arrangement of materials according to defined criteria for purposes of analysis. A method of relative dating". The term is used largely for projectile point styles and the expected chronometric dates associated with the various styles.

***Unmodified Debitage**:*

lithic material generated intentionally or inadvertently during chipped stone tool production and maintenance. It exhibits no evidence of subsequent modification or use.

Appendix 6

Minimum Analytical Nodule Analysis (MANA) Unit Definitions

IGNEOUS ROCKS

Andesite

Andesites are extrusive igneous rocks which have plagioclase and biotite as essentials and contain 56 - 63% silica. They range in color from blackish-brown to greenish. The texture is characteristically porphyritic (coarse grained), in which biotite and plagioclase phenocrysts are apparent in a moderately fine-grained groundmass (Mottana et al. 1978).

AND2

General: Grayish-red to reddish-brown and with light colored phenocrysts. Medium to coarse grained.
Munsell Color Notation: 10R 4/2 (primary)
Translucency: opaque
Luster: resinous to earthy
Texture: medium to coarse crystalline

Basalt

Basalts are medium to fine-grained extrusive igneous rocks which are frequently gray, black, reddish-brown, or greenish-black in color They are characterized by a preponderance of calcic plagioclase feldspars, and pyroxene together with minor amounts of accessory minerals such as olivine. Basalts typically contain 45 - 55% silica (Mottana et al. 1978).

BAS1

General: Gray to black microcrystalline. At a macroscopic level identical to spotted hornfels and dacite. Small infrequent xenoliths can be present within the matrix.
Munsell Color Notation: 7.5YR 3/N3 to 7.5YR 2/N2
Translucency: opaque
Luster: greasy to earthy
Texture: fine-grained to microcrystalline

Dacite

Dacites are extrusive igneous rocks that have plagioclase, biotite and hornblende as essentials and contain 63-70% silica. The known tool quality versions range in color from very dark gray to black. The texture is characteristically microcrystalline and it fractures conchoidally (Mottana et al. 1978). It should be understood, of course, that some non-igneous materials including some black cherts and spotted hornfels can be visually identical in color and texture to dacites and cannot be readily distinguished without detailed petrographic/petrochemical analysis work.

DAC1

General: Gray to black microcrystalline which exhibits flow banding on the cortex. Small infrequent xenoliths can be present within the dacite matrix. *Munsell Color Notation*: 7.5YR 3/N3 to 7.5YR 2/N2
Translucency: opaque
Luster: greasy to resinous
Texture: microcrystalline

Granite

Granites are intrusive igneous rocks which have quartz, potassic feldspar, plagioclase, and biotite mica as essentials. Colors range from white to light gray to pink to yellowish and rarely greenish. Granites exhibit a massive structure, are highly crystalline, with medium to coarse grain size (Mottana et al. 1978).

GRAN1a

General: Medium dark gray with small black specks and lighter colored quartz and feldspar crystals throughout the matrix.
Munsell Color Notation: 2.5 Y N4 (primary)
Translucency: opaque
Luster: earthy
Texture: coarse crystalline

GRAN3

General: Gray (5Y 6/1-5/1) with numerous dark crystals (5Y 2.5/1) throughout the matrix.
Munsell Color Notation: 5Y 6/1-5/1 (primary)
Translucency: opaque
Luster: resinous
Texture: medium crystalline

GRAN5

General: Mixture of yellowish and reddish brown with numerous clear and milky crystals and small dark specks and spots (manganese?).
Munsell Color Notation: 2.5Y 7/8 and 2.5YR5/6 (primary)
Translucency: opaque
Luster: resinous
Texture: medium-fine crystalline

Obsidian

Obsidians are volcanic glass derived from rapidly cooled viscous granitic magma (Mottana et al. 1978).

OBS1

General: Black in color and generally uniform in structure although some specimens can exhibit occasional micro-phenocrysts.
Munsell Color Notation: 2.5Y 2/N2
Translucency: opaque to slightly translucent
Luster: vitreous
Texture: cryptocrystalline

OBS2

General: Black in color and generally uniform in structure although some specimens can exhibit occasional micro-phenocrysts. Some thin pieces may appear bluish gray to nearly clear due to the high translucency of the material.
Munsell Color Notation: 2.5Y 2/N2
Translucency: moderately to highly translucent
Luster: vitreous
Texture: cryptocrystalline

Quartz

Quartz is a form of silicon oxide that is very hard and breaks with a conchoidal fracture but exhibits no cleavage. Quartz is derived from igneous magma and occurs in plutonic rocks (granites, granodiorites, tonalities) and in hypabyssal (granite porphyries, pegmatites) and volcanic rocks (quartz porphyry, rhyolites). Quartz can also form from superheated solution (geyserite) and from cold solutions (hyalites). Quartz can occur as well-formed crystals or in compact concretionary masses (Mottana et al. 1978).

QTZCRY1

General: Smoky quartz crystal. Light or dark brown to blackish tinted. True quartz crystals are hexagonal in form.
Munsell Color Notation: 2.5Y 2/N2 (general)
Translucency: moderately to highly translucent
Luster: vitreous
Texture: cryptocrystalline

QTZCRY2

General: clear/colorless quartz crystal. True quartz crystals are hexagonal in form.
Munsell Color Notation: N/A
Translucency: highly translucent
Luster: vitreous
Texture: cryptocrystalline

Rhyolite

Rhyolites are extrusive igneous rocks which have quartz and alkaline feldspar as essentials and contain 63 - 70% silica. Some specimens contain small glass (obsidian) shards within the matrix. Rhyolite can vary tremendously in color and texture (Mottana et al. 1978). Some non-igneous materials including some cherts/chalcedonies and silicified sediments can be visually identical in color and texture to rhyolites and cannot be readily distinguished without detailed petrographic/petrochemical analysis work.

RHY2

General: Uniform textured, very fine grained and highly siliceous, light gray to pale brown with numerous, very small glass (obsidian) shards within the matrix and, to a much lesser extent, small phenocrysts and crystallized cavities. Generally speaking, the material is very brittle and does not lend itself well to percussion flaking, as the author's attempts to reduce a series of large pieces of the raw material resulted in mostly short, thick chunks. Visually similar material, however, was used to a very limited extent in the Quinn Creek site (24JF110). A primary source for this material can be found in the SENE1/4 of Section 6, T11S R8W approximately 11 miles east of Red Rock, Montana, and in and site 24GN1192 approximately 22km (13mi) northwest of Drummond, Montana.
Munsell Color Notation: primary matrix color- 2.5Y 7/2 to 10YR 7/1to 10YR 6/3
Translucency: opaque
Luster: vitreous to resinous
Texture: microcrystalline to cryptocrystalline

RHY18

General: Uniform textured, vitreous, light gray (10Y 5/2) with occasional black glass specks and rounded feldspar crystals. The material is more glass-like than cryptocrystalline.
Munsell Color Notation: 10Y 5/2 (primary)
Translucency: opaque to slightly
Luster: vitreous
Texture: cryptocrystalline

SEDIMENTARY ROCKS

Hematite

Hematite is the mineral form of iron (III) oxide (Fe_2O_3). It can form through either sedimentary or igneous processes (Mottana et al. 1978).

HEM1

General: Reddish-brown (2.5YR 4/3) and sandy feeling to the touch. Light and dark inclusions (specks and spots) in the matrix.
Munsell Color Notation: 2.5YR 4/3 (primary)
Translucency: opaque
Luster: earthy
Texture: medium crystalline/gritty or granular

Cryptocrystalline silicates (includes microcrystalline silicates)

This category includes cryptocrystalline and microcrystalline varieties of highly siliceous sedimentary rock (silicon dioxide) referred to by Frondel (1965:171) as chalcedonic silica. Commonly used names for materials that would fall under this category include agate, chert, chalcedony, flint, jasper, opalite, carnelian, sard, sinter, some forms of silicified sediment, silicified limestone, silicified peat, and silicified wood. Because of the great variability among cryptocrystalline and microcrystalline silicates, the following categories are organized with reference to the primary color of each piece of material described.

Light Yellow To Light Brown

YBCCS1a

General: Yellowish-brown with dendrites that appear as black specks and dark, cloudy areas.
Munsell Color Notation: 10YR 5/6 to 10YR 5/8
Translucency: opaque
Luster: vitreous
Texture: cryptocrystalline

YBCCS1b

General: Yellowish-brown with dendrites that appear as occasional dark brown specks and small splotches.
Munsell Color Notation: 10YR 5/6 to 10YR 5/8
Translucency: slightly to moderately translucent
Luster: vitreous
Texture: cryptocrystalline

YBCCS1c

General: Uniform colored and textured, yellowish-brown chert.
Munsell Color Notation: 10YR 5/8
Translucency: opaque
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS1d

General: Yellowish-brown with dendrites that appear as dark reddish-brown (5YR 3/3) specks and smudges.
Munsell Color Notation: 10YR 5/6 to 10YR 5/8 (primary)
Translucency: opaque
Luster: vitreous to waxy

Texture: cryptocrystalline

YBCCS1e

General: Yellowish-brown with red dendrites that appear as specks and streaks.
Munsell Color Notation: 2.5YR 8/4 to 2.5Y 6/6 (primary)
Translucency: opaque to slightly
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS2

General: Yellowish-brown with red dendrites or spots.
Munsell Color Notation: 10YR 6/8
Translucency: opaque to moderately translucent
Luster: vitreous
Texture: cryptocrystalline

YBCCS3

General: Pale olive to weak yellowish-brown with numerous white spots and some opaque whitish zones.
Munsell Color Notation: 5Y 6/3
Translucency: slightly to moderately
Luster: vitreous
Texture: cryptocrystalline

YBCCS4

General: Brownish-yellow to yellowish-brown with dendritic inclusions that appear as black specks, black fern-like patterns, or brown splotches and/or cloud-like patterns. Some specimens include red mottling.
Munsell Color Notation: 10YR 3/3-3/6, 10YR 4/6, or 10YR 5/6
Translucency: slightly to highly translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS5

General: Brownish-yellow to yellowish-brown which grades almost imperceptibly to light gray brown and often to beige. Some specimens exhibit dendritic inclusions that appear as black specks, black fern-like patterns, or brown splotches and/or cloud-like patterns. *Munsell Color Notation*: 10YR 3/2-3/6, 10YR 4/6, or 10YR 5/6
Translucency: moderately to highly translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS6

General: Rather uniform yellowish-brown to dark yellowish-brown. Some specimens include light colored splotches.
Munsell Color Notation: 10YR 3/4-3/6
Translucency: opaque
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS7

General: chert/chalcedony that uniformly grades from beige to gray to brown to yellowish brown. Some specimens exhibit small, light-colored specks and/or dark dendritic spots.
Munsell Color Notation: 10YR 8/1-8/2, 10YR 5/1 to 10YR4/2 to 10YR 4/6

Translucency: moderately to highly translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS8

General: Primary color is light olive brown with frequent lines or narrow bands that range in color from bluish-white to light gray. Within some of the banding are narrow lines and small areas that have a reddish tint. Some specimens abruptly grade from the primary color into broader areas of bluish-white or beige/pale yellow.
Munsell Color Notation: 2.5YR 5/4 -5/6 (primary color); 2.5YR N8/ and 2.5YR N7/ (banding color); 2.5YR N8/-8/2, 2.5YR 8/4 (transitional colors)
Translucency: slightly to moderately translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS9

General: Banded (micro or macro) light brownish-gray (2.5Y 6/2) to grayish-brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) to dark reddish-gray (5YR 4/2). Some pieces exhibit small white specks or occasional dark reddish-brown (5YR 2.5/2) streaks, splotches, or specks.
Munsell Color Notation: See above description
Translucency: moderately
Luster: greasy to waxy
Texture: cryptocrystalline

YBCCS11

General: Yellowish-brown with occasional dendrites that appear as dark reddish-brown specks and small splotches.
Munsell Color Notation: 10YR 5/6 to 10 YR 5/8 (Primary colors); inclusion color (2.5 YR 3/4
Translucency: moderately to highly translucent
Luster: vitreous
Texture: cryptocrystalline

YBCCS12

General: Brownish-yellow to yellowish-brown highly siliceous material which grades abruptly into off white colored cortex. Some specimens exhibit dendritic inclusions that appear as black specks or black fern-like patterns. The material appears somewhat cloudy when held to a light source.
Munsell Color Notation: 10YR 5/6-5/8 to 10YR 6/8
Translucency: moderately to highly translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS14

General: Highly siliceous dark yellowish-brown material with colorless to slightly milky colored zones, spots and swirls and numerous inclusive dark specks. Some specimens grade abruptly to dusky green (5G 3/2), dusky blue green (5GB 3/2), and/or a pale yellow (2.5Y 7/4) with frequent dark specks and highly siliceous dark brown inclusions. Many specimens give the impression of banding although this observation is difficult to quantify. Known sources include Tom Miner Basin and the greater Yellowstone Park area.
Munsell Color Notation: 10YR 4/4 to 10YR 4/6 (primary)
Translucency: moderately to highly translucent
Luster: vitreous to earthy
Texture: cryptocrystalline

YBCCS15

General: Yellowish-brown (10YR 5/8) that abruptly transitions to very pale brown (10YR 7/4).
Munsell Color Notation: 10YR 5/8 to 10YR 7/4 (primary)
Translucency: opaque to slightly translucent
Luster: earthy to waxy
Texture: cryptocrystalline

YBCCS16

General: Uniform textured and colored olive yellow material with faint brownish gray streaks, specks or blotchy areas.
Munsell Color Notation: 2.5Y 6/6 to 2.5Y 6/8 (primary)
Translucency: opaque to slightly translucent
Luster: waxy to cryptocrystalline
Texture: cryptocrystalline

YBCCS17

General: Mottled yellow, brown, and milky/colorless chert.
Munsell Color Notation: 10YR 7/10, 10YR 4/4, 7.5YR N/8 (primary mottled colors)
Translucency: opaque to slightly translucent
Luster: waxy to cryptocrystalline
Texture: cryptocrystalline

YBCCS18

General: Strong brown (7.5YR 5/6) CCS that transitions abruptly into dusky red (10R 3/4). Occasional to frequent dark dendritic spots and specks in the matrix.
Munsell Color Notation: see above
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

YBCCS19

General: Brecciated, slightly grainy, dark yellowish brown (10YR 4/4) with intermixed yellowish-brown (10YR 5/6) zones/inclusions.
Munsell Color Notation: 10YR 4/4 (primary) 10YR 5/6 (secondary)
Translucency: opaque to slightly translucent
Luster: resinous to microcrystalline
Texture: microcrystalline

YBCCS21

General: Highly siliceous yellowish brown (10YR 5/6) with narrow, approximately parallel bands/streaks of olive gray and dark brown.
Munsell Color Notation: (10YR 5/6)
Translucency: opaque to slightly translucent
Luster: vitreous
Texture: cryptocrystalline to microcrystalline

YBCCS22

General: Dark yellowish brown (10YR 4/4) with occasional reddish zones and dark gray to black specks, spots, and dendritic inclusions.
Munsell Color Notation: (10YR 4/4)
Translucency: opaque
Luster: earthy to resinous
Texture: microcrystalline

YBCCS23

General: Dark yellowish-brown (10YR 6/10[approx.]) with frequent dark specks and occasional dendritic inclusions.
Munsell Color Notation: 10YR 6/10 (approximate primary color)
Translucency: opaque
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS24

General: Uniform brownish-yellow (10YR 6/8) with occasional to frequent dark-brown zones (7.5YR 4/4).
Munsell Color Notation: 10YR 6/8 (primary color)
Translucency: moderately translucent
Luster: earthy to waxy
Texture: cryptocrystalline

YBCCS25

General: Uniform dark yellowish-brown (10YR 6/10) with numerous dark (black or dark reddish-brown) specks and dendritic inclusions.
Munsell Color Notation: 10YR 6/10 (primary color)
Translucency: moderately to highly
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS27

General: Uniform colored and textured light yellowish-brown (10YR 6/4) to brown (10YR 5/3) chert.
Munsell Color Notation: 10YR 6/4 (primary color)
Translucency: opaque
Luster: earthy to slightly greasy
Texture: cryptocrystalline

YBCCS28

General: Uniform colored and textured dark yellowish-brown (10YR 3/6) chert/chalcedony.
Munsell Color Notation: 10YR 3/6 (primary color)
Translucency: slightly to moderately
Luster: earthy to waxy
Texture: cryptocrystalline

YBCCS29

General: Yellowish-brown (10YR 5/4) chert/chalcedony with occasional dark specks or streaks. Some pieces change abruptly into colorless zones without a textural change.
Munsell Color Notation: 10YR 5/4 (primary color)
Translucency: moderately
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS30

General: Uniform colored and textured yellowish-brown (10YR 6/10) with some opaque whitish zones.
Munsell Color Notation: 10YR 6/10
Translucency: moderately to highly
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS31

General: Pale yellow (2.5Y 7/8) that grades imperceptibly into beige (2.5Y 8.5/4). Dark specks and spots are frequent.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS32

General: Yellowish-beige (10YR 8/4) with slight lavender-colored zones. Black specks, spots, and brownish-red lines can occur.
Munsell Color Notation: 10YR 8/4 (primary)
Translucency: opaque
Luster: vitreous
Texture: cryptocrystalline

YBCCS33a

General: Dark yellowish-brown, slightly crystalline chert for which a Munsell color notation is not available. Closest match is Pantone (C;15, M:55, Y100, K:2). Contains occasional dark specks in the matrix.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to slightly waxy
Texture: microcrystalline

YBCCS33b

General: Dark yellowish-brown, vitreous chert for which a Munsell color notation is not available. Closest match is Pantone (C;15, M:55, Y100, K:2). Contains numerous dark specks in the matrix.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

YBCCS34

General: Dark yellowish-brown (2.5Y 5/6) with broad bluish-gray (2.5GY 3/2) streaks and zones.
Munsell Color Notation: see above description
Translucency: opaque
Luster: vitreous to greasy
Texture: cryptocrystalline

YBCCS35

General: Olive brown (2.5Y 4/4) to dark olive brown (2.5Y 3/3) with occasional dark specks and spots.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: waxy
Texture: cryptocrystalline

YBCCS36

General: Light yellowish-brown (primary: 2.5Y 6/4) with heavily mottled to brecciated light olive brown (2.5Y 5/4), strong brown (7.5YR 4/6), and milky to colorless inclusions.
Munsell Color Notation: See above description
Translucency: slightly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS37

General: Pale yellow (2.5Y 6/6) with occasional black speck and spots some reddish (2.5YR 4/6) colored zones.
Munsell Color Notation: See above description
Translucency: slightly to moderately translucent
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS38

General: Strong brown (7.5YR 4/6) to yellowish-brown (10YR 5/8) with occasional dark yellowish-brown (10YR 3/4) lines, zones, and specks. *Munsell Color Notation*: see above.
Translucency: moderately translucent
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS39

General: The material at first appears brownish, but upon closer inspection the primary matrix color may be best described as colorless to clear with a dominant strong brown cloudy inclusion which gives the material an overall brown appearance.
Munsell Color Notation: 7.5YR 5/6 to 7.5YR 5/8 (primary color of cloudy inclusion)
Translucency: opaque to slightly translucent
Luster: vitreous
Texture: cryptocrystalline

YBCCS40

General: Olive brown (2.5Y 4/4) to light olive brown (2.5Y 5/4-5/6) with frequent milky specks and spots, and occasional dark red (10R 3/6) smears and small splotches.
Munsell Color Notation: See above description
Translucency: opaque to slightly translucent
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS41

General: Dark yellowish-brown (Pantone designation C:34 M:64 Y:100 K:25) chert/chalcedony with occasional dark specks/small spots, dendrites, or vein-like lines. Occasional red lines may also occur.
Munsell Color Notation: see above description
Translucency: opaque
Luster: slightly waxy to waxy
Texture: cryptocrystalline

YBCCS42

General: Pale yellowish-brown (10YR 6/3 [approx..]).
Munsell Color Notation: !0YR 6/3 (approximate)
Translucency: opaque
Luster: earthy
Texture: microcrystalline (slightly grainy looking)

YBCCS43

General: Very pale brown (10YR 7/4) with dark gray to black specks, splotches, and dendrtic inclusions. hermally altered exterior surfaces appear to approximate a reddish hue (10R 4/8-5/8).
Munsell Color Notation: See above description
Translucency: opaque to slightly
Luster: earthy to waxy

Texture: microcrystalline (slightly grainy looking) to cryptocrystalline

YBCCS44

General: Brownish-yellow (10YR 7/6) with whitish (milky), cloudy areas. Some specimens can have occasional reddish-brown (7.5YR 6/8) cloudy areas.
Munsell Color Notation: see above description
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS45

General: Light olive brown (primary: 2.5Y 7/8) with dark specks and dendrites that sometimes cluster to form blackish areas. Some segments of whitish (2.5Y 8/2) silicified limestone cortex abruptly transitions into the primary colors.
Munsell Color Notation: See above description
Translucency: slightly to moderately translucent
Luster: earthy to waxy
Texture: cryptocrystalline to microcrystalline

YBCCS46

General: Light yellowish-brown (primary: 2.5Y 6/3) with occasional dark, reddish, or whitish specks, spots, and smudges.
Munsell Color Notation: See above description
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS47

General: Light olive-brown (2.5Y 5/6) with numerous black lines, veins, specks, spots, and cloudy areas. Some areas transition into dark red (10R 3/6).
Munsell Color Notation: See above description
Translucency: opaque
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS48

General: Yellowish-brown (Pantone designation C:18 M:44 Y:100 K:1) chert/chalcedony with occasional clear/colorless specks. Some pieces have an occasional brown band.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

YBCCS49

General: Yellowish-brown (10YR 6/6) grainy chert or possibly siliceous sediment with infrequent dark specks, and occasional dark red to dusky red zones.
Munsell Color Notation: 10YR 6/6 (primary color)
Translucency: opaque
Luster: earthy to slightly resinous
Texture: microcrystalline

YBCCS50

General: Lightly mottled to slightly swirled yellowish-browns and browns (10YR 6/8, 10YR 5/6, 10YR 4/4).
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

YBCCS51

General: Brown to pinkish-brown with blackish and reddish-brown dendrites that appear as specks and streaks.
Munsell Color Notation: 7.5YR 4/6 to 2.5Y 6/6 (primary)
Translucency: slightly to moderately
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS52

General: Light-brown to tan with comparatively large, red, roughly round inclusions that give the piece a spotty appearance.
Munsell Color Notation: 10YR 5/6 to 10YR 7/4 (primary)
Translucency: opaque to slightly
Luster: earthy to slightly waxy
Texture: microcrystalline to cryptocrystalline

YBCCS53

General: Brecciated tan and very dark-brown chert.
Munsell Color Notation: 10YR 2.5/1 to 2.5Y 7/6 (primary)
Translucency: opaque to slightly
Luster: vitreous to waxy
Texture: cryptocrystalline

YBCCS54

General: Orangish-yellow (10YR 6/10) with frequent dark specks, smears and splotches.
Munsell Color Notation: See above description
Translucency: opaque to slightly translucent
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS55

General: Yellowish-brown (10YR 6/8) with grayish-brown zones and frequent dark dendritic inclusions.
Munsell Color Notation: See above description
Translucency: slightly to moderately translucent
Luster: waxy to vitreous
Texture: cryptocrystalline

YBCCS56

General: Pale yellowish (2.5Y 8.5/4) that transitions to dark red (10R 4/4). Numerous black and red specks (inclusions) throughout the material.
Munsell Color Notation: See above description
Translucency: slightly to moderately translucent
Luster: waxy to slightly grainy
Texture: cryptocrystalline to microcrystalline

Medium Brown to Very Dark Brown

BCCS1

General: Brown with dark-gray dendrites (largely specks and lines).
Munsell Color Notation: 10YR 4/3 (primary)
Translucency: opaque
Luster: resinous to greasy
Texture: cryptocrystalline to microcrystalline

BCCS2

General: Dark brown to dark yellowish-brown. Some specimens include black dendrites that appear as specks and swirls.
Munsell Color Notation: 10YR 3/3 – 10YR 3/4
Translucency: opaque to slightly translucent
Luster: vitreous
Texture: cryptocrystalline

BCCS3

General: Dark brown with occasional faint yellowish-brown zones and infrequent dark specks, spots or blotches.
Munsell Color Notation: 10YR 3/3 (primary)
Translucency: slightly translucent
Luster: vitreous to greasy
Texture: cryptocrystalline

BCCS4

General: Highly siliceous brown to very dark brown (primary) material that is generally free of internal fractures, inclusions, and vugs although some specimens exhibit small whitish colored spots that may be fossils. Some specimens grade into mottled-brown with minor areas of white (7.5YR N8/). The material appears to sun-bleach/weather to a bluish-white in color although none of the specimens observed exhibit extensive bleaching.
Munsell Color Notation: 7.5YR 3/3 to 7.5YR 3/4 (primary); 7.5YR 4/4 or 5/4 (brown mottling)
Translucency: slightly to highly translucent
Luster: vitreous to resinous
Texture: cryptocrystalline

BCCS5

General: Highly siliceous black to very dark brown (primary) material that is generally free of internal fractures and vugs, but some pieces exhibit small whitish inclusions which may be gastropod fossils although some specimens exhibit small whitish colored spots that may be fossils and/or light bluish-gray (5B 7/1) lines and inclusions. The material appears to sun-bleach/weather to a bluish-white color although none of the specimens observed exhibit extensive bleaching. Remnant, whitish, undulating limestone cortex observed on some of the pieces may indicate that these materials formed as nodules within limestone cavities.
Munsell Color Notation: 10YR 2/1 to 2/2 (primary)
Translucency: slightly to moderately translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

BCCS6

General: Highly siliceous, dark reddish-brown (primary) material that is generally free of internal fractures and vugs. This material is often referred to as “Knife River Flint”, but origins are not necessarily in North Dakota as many known chert sources in Montana can, in part, produce similar looking materials. The material appears to sun-bleach/weather to a bluish-white color although none of the

specimens observed exhibit extensively bleached areas. Remnant, whitish, undulating limestone cortex observed on some of the pieces may indicate that these materials formed as nodules within limestone cavities. It may be of interest to note that a sulphur-yellow color appears on some areas of the cortex of the specimens observed.

Munsell Color Notation: 5YR 3/2 - 3/3 to 5YR 2.5/2 (primary)
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

BCCS7

General: Opaque to slightly translucent, dark brown material with strong yellowish-brown (10YR 6/8) and very pale-brown (10YR 7/3) mottling.
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent
Luster: waxy
Texture: cryptocrystalline

BCCS8

General: Generally mottled dark or swirled grayish-brown (10YR 3/2) and light gray (10 YR 3/2) although some zones may be one color or the other exclusively. Grades from vitreous to slightly grainy.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to slightly vitreous
Texture: cryptocrystalline to microcrystalline

BCCS9

General: Very dark brown to blackish with frequent yellowish-brown zones.
Munsell Color Notation: 10YR 2/1 and 10YR 5/8 (primary)
Translucency: opaque to slightly translucent
Luster: vitreous
Texture: cryptocrystalline

BCCS11

General: Light brownish-gray to very pale brown with occasional dark lines and specks.
Munsell Color Notation: 10YR 7/2 to 10YR 7/3 (primary)
Translucency: opaque to slightly translucent
Luster: waxy
Texture: cryptocrystalline

BCCS12

General: Dark brown to strong brown (10YR 4/2) with occasional beige zones and dark specks.
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent
Luster: earthy to waxy
Texture: cryptocrystalline

BCCS13

General: Highly siliceous reddish-brown material.
Munsell Color Notation: 5YR 4/4 (approximate)
Translucency: opaque
Luster: greasy to waxy
Texture: cryptocrystalline

BCCS14

General: Brecciated, highly siliceous, very dark grayish brown (10YR 3/2) with intermixed dark yellowish brown (10YR 4/6) zones/inclusions.
Munsell Color Notation: 10YR 3/2 (primary, but only marginally so)
Translucency: opaque to slightly translucent
Luster: cryptocrystalline to microcrystalline
Texture: cryptocrystalline to microcrystalline

BCCS15

General: Highly siliceous, olive brown (2.5Y 4/3) to olive gray (5Y 4/2) to grayish-brown (2.5Y 5/2) chert.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy to greasy
Texture: cryptocrystalline

BCCS16

General: Very dark grayish brown (10YR 3/2) that abruptly transitions to light brownish gray (10YR 6/2). Some swirling and mottling of these two colors also occur. Whitish limestone cortex noted on some specimens.
Munsell Color Notation: 10YR 3/2 and 10YR 6/2
Translucency: opaque
Luster: earthy to waxy
Texture: microcrystalline to cryptocrystalline

BCCS18

General: Reddish-brown (7.5YR 5/8) to brownish-red (2.5YR 4/4) frequent dark splotches and dendritic inclusions.
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent
Luster: slightly waxy
Texture: cryptocrystalline

BCCS19

General: Brown chert (10YR 3/3) with very pale brown (10YR 8/3) highly silicified limestone inclusions/mottling or possibly oolitic fossils. *Munsell Color Notation*: 10YR 3/3 (primary)
Translucency: slightly to moderately translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

BCCS20

General: Dark grayish (10YR 4/21) that abruptly transitions to light brownish gray (10YR 6/2). Some light and dark colored inclusions throughout the matrix.
Munsell Color Notation: 10YR 4/1 and 10YR 6/2
Translucency: opaque
Luster: earthy to slightly waxy
Texture: microcrystalline to cryptocrystalline

BCCS21

General: Very dark-gray (2.5YR N3/) glassy CCS with frequent black (2.5YR N2.5/) specks and cloudy areas. Cortex is a pale-yellow limestone.
Munsell Color Notation: 2.5YR N3/
Translucency: moderately to highly
Luster: waxy to vitreous

Texture: cryptocrystalline

BCCS23

General: Very dark reddish-brown (5YR 3/2) with occasional faint light gray inclusions.
Munsell Color Notation: see above
Translucency: opaque to slightly
Luster: waxy
Texture: cryptocrystalline

BCCS25

General: Very dark grayish-brown (2.5Y 3/2) with occasional dark streaks and spots in the matrix.
Munsell Color Notation: 2.5Y 3/2
Translucency: opaque to slightly
Luster: waxy
Texture: cryptocrystalline

BCCS26

General: Very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) CCS. Some pieces retain whitish limestone cortex.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: waxy
Texture: cryptocrystalline

BCCS27

General: Very dark reddish-brown (10YR 2/2 [approx.]) CCS.
Munsell Color Notation: see above
Translucency: moderately to highly
Luster: waxy
Texture: cryptocrystalline

BCCS28

General: Very dark brown (10YR 3/1) that is slightly grainy. Uniform in color and texture. Moderately translucent along very thin edges.
Munsell Color Notation: 10YR 2/2
Translucency: slightly
Luster: resinous
Texture: microcrystalline

BCCS29

General: Highly siliceous, very dark grayish-brown (10YR 3/2) chert/chalcedony that abruptly changes to dark yellowish-brown (10YR 4/6). Numerous, faint microbands and swirls of very dark brown (10YR 2/2) to yellowish-brown (10YR 5/4).
Munsell Color Notation: see above description
Translucency: moderately
Luster: waxy to greasy
Texture: cryptocrystalline

BCCS31

General: Highly siliceous, dark olive gray (5Y 3/2) to very dark grayish-brown (2.5Y 3/2) chert/chalcedony. Uniform in color and texture. Moderately translucent along very thin edges.
Munsell Color Notation: 5Y 3/2 to 2.5Y 3/2
Translucency: slightly
Luster: waxy

Texture: cryptocrystalline to microcrystalline

BCCS32

General: Black (10YR 1/1) and light olive brown (2.5Y 5/4 to 2.5Y 5/6) CCS that changes abruptly from one color to the other.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: waxy
Texture: cryptocrystalline

BCCS33

General: Dark olive brown (2.5Y 3/3) to dark brown (10YR 3/3) chert with occasional black (10YR 2/1) specks or streaks, or even larger zones of black.
Munsell Color Notation: see above
Translucency: slightly
Luster: waxy to greasy
Texture: cryptocrystalline

BCCS34

General: Reddish-brown (5YR 4/4) to strong brown (7.5YR 4/6) chert.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to slightly waxy
Texture: cryptocrystalline

BCCS36

General: Swirled or banded yellowish-brown (10YR 5/8) and dark brown (10YR 3/3) with numerous dark brown specks.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy
Texture: microcrystalline

BCCS37

General: Dark reddish-brown (10R 4/2) CCS.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy
Texture: cryptocrystalline

BCCS38

General: Dark grayish-brown (10YR 4/1) with faint lines/swirls of a reddish-brown (7.5 YR 6/6).
Munsell Color Notation: See above description
Translucency: slightly to moderately
Luster: waxy
Texture: cryptocrystalline

BCCS39

General: Mottled dark brown to strong brown with numerous beige and dusky red (10R 4/8) zones.
Munsell Color Notation: 7.5YR 4/4 to 7.5YR 4/6 (primary)
Translucency: opaque to slightly translucent
Luster: waxy
Texture: cryptocrystalline

BCCS40

General: Light brown with numerous off-white specks and occasional dark-brown (5YR 4/4) inclusions.
Munsell Color Notation: 5YR 6/4 (primary)
Translucency: opaque to slightly translucent
Luster: earthy to slightly waxy
Texture: cryptocrystalline

BCCS41

General: Orangish-brown (2.5YR 4/8) with occasional pale-yellowish (7.5YR 8/8) zones. Thin pieces appear cloudy when held to a light source. *Munsell Color Notation*: See above description
Translucency: moderately to highly
Luster: vitreous to waxy
Texture: cryptocrystalline

BCCS42

General: Yellowish-red to orangish-brown (5YR 4/6) with black specks, lines, and dendritic inclusions.
Munsell Color Notation: 5YR 4/6 (primary)
Translucency: slightly
Luster: earthy to waxy
Texture: cryptocrystalline

BCCS43

General: Dark brown (7.5YR 4/4) with occasional, faint, light-brown (7.5 YR 7/6) specks.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

BCCS44

General: Alternating or swirled dark brown, medium- brown, and yellowish-brown, chert.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline to microcrystalline

BCCS45

General: Light reddish-brown (2.5YR 5/4) at interior but becomes increasingly light-gray/beige toward exterior surface.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy
Texture: microcrystalline

BCCS46

General: Dark reddish-brown (7.5YR 4/4) with occasional black dendrites, streaks, or lines.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

BCCS47

General: Dark reddish-brown (7.5YR 4/4) with small whitish inclusions.
Munsell Color Notation: See above description
Translucency: opaque to slightly

Luster: earthy to waxy
Texture: cryptocrystalline to microcrystalline

Gray to Black

GBCCS3

General: Beige with a faint pinkish cast and very dark (blackish) reddish-gray (10R 3/1) zones.
Munsell Color Notation: see above
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

GBCCS5

General: A marbled, highly fossiliferous (primarily very small gastropods), opaque to moderately translucent (especially along thin edges) material which generally approximates a gray to grayish-brown hue with numerous white colored fossils/fossil fragments and occasional dark pecks. Some specimens grade into a marbled, white color that may reflect silicified deposits of "fossil hash". In some instances, the white areas reflect sun-bleaching/weathering of an exposed surface. The primary matrix color of a limited number of specimens is a light gray to very pale brown. The specimens observed tend to be large blocky pieces which may indicate they were formed as a vein within a parent body of rock. Internal fractures and vugs are common. Limited areas of cortex tend to be thin, flat, rough and reddish-brown in color.
Munsell Color Notation: 10YR 5/1 to 10YR 5/2 or 10YR 7/2 – 7/3 (primary matrix colors); 7.5YR N8/ (individual fossils, "fossil hash" zones, and possibly some patinated areas)
Translucency: opaque to moderately translucent
Luster: waxen to vitreous
Texture: cryptocrystalline

GBCCS6

General: Bluish-gray (10BG 6/1) hue with numerous very small brownish-gray angular inclusions and occasional cloudy zones.
Munsell Color Notation: see above description
Translucency: slightly translucent
Luster: resinous
Texture: cryptocrystalline, but rough feeling

GBCCS9

General: A highly siliceous, marbled very dark-brown/black and yellowish-brown material with bluishwhite cloudy areas as well as occasional very small gastropod fossils or possibly vugs. The material appears to sun-bleach to a bluish-white color. The cortex is brownish-yellow (10YR 6/6) colored limestone.
Munsell Color Notation: 10YR 2/1 (primary matrix color); 10YR 5/8 (marbling)
Translucency: slightly to moderately translucent
Luster: waxen to vitreous
Texture: cryptocrystalline

GBCCS10

General: "Coffee and cream marbled chert". Very pale brown (10YR 7/3) that abruptly changes to dark reddish-brown (5YR 3/3) or black (5YR 2.5) or brown (7.5YR 5/3) with small dark brown specks and dark brown marbling lines (7.5YR 3/4). The material sun bleaches/weathers to a deep chalky white with small brown specks or lines. The specimens used to define this class originated at the Antelope Hill source in the Avon Valley of Montana and Bowman Creek near Glacier Park. It is commonly referred to as "Avon Chert" when found out of context.
Munsell Color Notation: See above description

Translucency: opaque
Luster: earthy to vitreous
Texture: cryptocrystalline

GBCCS11
General: Mottled, gray (2.5Y N 5/) and milky/beige CCS.
Munsell Color Notation: See above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

GBCCS12
General: Olive brown (5Y 5/4) with occasional bright red (7.5R 4/10) streaks and zones.
Munsell Color Notation: 5Y 5/4 (primary)
Translucency: opaque
Luster: greasy
Texture: cryptocrystalline

GBCCS13
General: Opaque, slightly grainy, black chert (10YR 3/1).
Munsell Color Notation: (10YR 3/1)
Translucency: opaque
Luster: earthy
Texture: cryptocrystalline to microcrystalline

GBCCS14
General: Slightly mixed/mottled light and medium shades of beige and gray (2.5Y 9/2, 2.5Y 5/2, and 10YR 7/4).
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: waxy
Texture: cryptocrystalline

GBCCS15
General: Bluish-gray (2.5B 5/2) with whitish/beige cloudy zones.
Munsell Color Notation: 2.5B 5/2
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

GBCCS16
General: Highly to moderately siliceous, uniform colored and textured black to very dark gray material.
Munsell Color Notation: 5Y 2.5/1 to 5Y 2.5/2
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline to slightly grainy

GBCCS17
General: Milky to colorless with a slight bluish-gray cast, marled blackish streaks, and occasional brown zones.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: earthy to slightly waxy

Texture: cryptocrystalline

GBCCS18

General: Similar color description as GBCCS17, but material lacks blackish streaks and contains blackish specks sometimes so densely clustered as to form cloudy zones. Reddish-brown smears, streaks and zones (10 R 4/6) also present.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: earthy to slightly waxy
Texture: cryptocrystalline to microcrystalline

GBCCS19

General: Uniform gray (slightly bluish-gray) chert.
Munsell Color Notation: 5B 5/1
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

GBCCS20

General: Very dark brownish-gray (7.5YR 3/2) that fades to lighter grayish shades with some off-white spots.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: earthy to slightly waxy
Texture: cryptocrystalline

GBCCS21

General: Olive-gray (5Y 8/4) with fine, thin gray (5Y 7/2) bands.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to slightly waxy
Texture: microcrystalline

GBCCS26

General: Gray (2.5Y N5/) to dark-gray (2.5Y N4/) with frequent very dark-gray (2.5Y N3/) specks. *Munsell Color Notation*: see above description
Translucency: opaque
Luster: waxy to vitreous
Texture: cryptocrystalline

GBCCS28

General: Dark gray (10YR 4/1) to yellowish-brown (10YR 5/4) CCS with occasional to frequent dark and light specks and spots.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: waxy
Texture: cryptocrystalline

GBCCS31

General: Gray (2.5YR N5/ to 2.5YR N6/) CCS with occasional dark and light-colored specks in the matrix.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: waxy

Texture: cryptocrystalline

GBCCS36

General: Uniform colored and textured black (10YR 2/1) to very dark brown (10YR 2/2) chert.
Munsell Color Notation: See above description
Translucency: opaque
Luster: waxy to slightly vitreous
Texture: cryptocrystalline

GBCCS38

General: Dark gray (7.5YR 3/2) chert.
Munsell Color Notation: 7.5YR 3/2
Translucency: opaque
Luster: earthy to slightly waxy
Texture: cryptocrystalline to microcrystalline

GBCCS39

General: Highly siliceous, marled gray material. Ranges abruptly from light gray (5Y 7/1) to gray (5Y 5/1) to dark gray (5Y 4/1). Some zones and smears of a dark brown (7.5 YR 3/4) occasionally occur.
Munsell Color Notation: see above description
Translucency: slightly to moderately
Luster: waxy to greasy
Texture: cryptocrystalline

GBCCS41

General: Dark grayish-brown (10Y 4/2) slightly grainy chert that is generally uniform in color and texture.
Munsell Color Notation: 10Y 4/2 (approximately)
Translucency: opaque
Luster: earthy
Texture: cryptocrystalline to microcrystalline

GBCCS43

General: Dark gray (5Y 4/1) chert that appears to sun bleach to a light brownish-gray (2.5Y 6/2).
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to slightly vitreous
Texture: cryptocrystalline to fine crystalline

GBCCS66

General: Highly siliceous, dark olive gray (5Y 3/2) to olive gray (5Y 4/2) chert/chalcedony. Specimen is a piece of silicified wood. Cortex shows wood grain and is pale yellow (2.5Y 8/3) with dark yellowishbrown (10YR 4/6) highlights.
Munsell Color Notation: 5Y 3/2 to 5Y 4/2
Translucency: slightly
Luster: waxy
Texture: cryptocrystalline to microcrystalline

Green

GRCCS1

General: Highly siliceous and generally uniform textured material that ranges from uniformly dusky green or dusky blue green, to mottled green/colorless, to mottled green/brown. Some specimens give the impression of banding although this observation is difficult to quantify. Known sources include Tom Miner Basin and the greater Yellowstone Park area.

Munsell Color Notation: 5G 3/2 to 5GB 3/2 (primary)
Translucency: slightly to highly translucent
Luster: vitreous to earthy
Texture: cryptocrystalline to microcrystalline

Blue-Gray to Dark Purple

BPCCS2

General: Very dusky purple (5RP 2/2) to dusky red (10R 3/2) to dark reddish gray (10R 3/1) chert with occasional mottling of a whitish (10YR 8/1) color.
Munsell Color Notation: See above description
Translucency: opaque
Luster: earthy to slightly greasy
Texture: cryptocrystalline to fine crystalline

BPCCS5

General: Very dark (blackish) purplish-red (10RP 2.5/1) CCS.
Munsell Color Notation: 10RP 2.5/1
Translucency: slightly
Luster: waxy
Texture: cryptocrystalline

Pink to Dark Red

RCCS1

General: White/milky white chalcedony with reddish-gray (10R 6/1) and weak red (10R 5/2) zones or mottling.
Munsell Color Notation: see above description
Translucency: moderately translucent
Luster: waxy
Texture: cryptocrystalline

RCCS2

General: Dull reddish (7.5R 4/6) exterior with yellowish-brown (10YR 5/6) interior. Material exhibits occasional dark lines and specks. This specimen is heat-treated yellowish-brown (10YR 5/6) chert. The red exterior formed during heating.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

RCCS3

General: mottled dark red to light red with small black streaks/lines and/or small black specks. Some specimens included mottling of yellowish-browns and browns, but the specimen is more than 50% reddish in color.
Munsell Color Notation: 10R 3/2-3/4 to 2.5YR 2.5/4
Translucency: opaque to slightly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

RCCS4

General: Dark reddish (7.5R 3/4) exterior with yellowish-brown (10YR 5/6) interior. Material exhibits occasional dark lines and specks. This specimen is poorly (overly heated) heat-treated yellowish-brown (10YR 5/6) chert. The red exterior formed during heating.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy to resinous
Texture: cryptocrystalline

RCCS5

General: Uniformly dark red.
Munsell Color Notation: 7.5R 3/6
Translucency: opaque
Luster: vitreous to waxy
Texture: cryptocrystalline

RCCS6

General: Dark red (7.5R 3/4) with lighter red (7.5R 5/8) mottling. Some specimens contain infrequent, small dark inclusions.
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent
Luster: vitreous to resinous
Texture: cryptocrystalline

RCCS7

General: Dark reddish-gray (10R 3/2) CCS.
Munsell Color Notation: 10R 3/2 (primary)
Translucency: opaque
Luster: vitreous to greasy
Texture: cryptocrystalline

RCCS8

General: Pinkish-gray (10R 7/4) with gray (10R 6/2) and dark reddish-gray (10R 4/2) highly siliceous, angular inclusions that give a somewhat brecciated appearance.
Munsell Color Notation: see above description
Translucency: opaque (primary matrix). Angular inclusions are moderately translucent. *Luster*: earthy to waxy
Texture: very-fine crystalline to cryptocrystalline

RCCS9

General: A slightly fossiliferous material where the primary matrix colors appear to be a grayish-red and reddish-gray, but the strong dark reddish-brown to dusky red mottling makes this assessment difficult. When held against a back-light the material appears yellowish-brown (10YR 5/8) with dense dark reddish inclusions. Freshly flaked surfaces appear to patinate to a chalky white color. Cortex is a weathered, smooth rind that is primarily olive-yellow (2.5Y 6/6) in color with numerous dark-reddish inclusions.
Munsell Color Notation: 10R 4/2 (primary); 10R 3/3-3/4 (mottling)
Translucency: moderately translucent
Luster: waxy
Texture: cryptocrystalline

RCCS11

General: Reddish-brown highly siliceous material with whitish-gray cloudy areas.
Munsell Color Notation: 5YR 4/3 (primary)

Translucency: moderately to highly translucent
Luster: vitreous
Texture: cryptocrystalline

RCCS12

General: Dusky red (10R 3/2) with numerous black specks or dendritic inclusions. Some areas of inclusions are so densely packed they appear as smears or splotches.
Munsell Color Notation: 10R 3/2
Translucency: opaque
Luster: waxy to vitreous
Texture: cryptocrystalline

RCCS13

General: Dark red (5R 3/2) with ivory colored (2.5Y 9/2) zones that exhibit numerous dark red (5R 3/2) specks.
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent
Luster: earthy to greasy
Texture: cryptocrystalline

RCCS14

General: Swirled grayish-red (7.5R 6/6) and very dark red (7.5R 3/2) gives a tiger stripe appearance. Some zones of pinkish-gray (10R 9/2) can also occur.
Munsell Color Notation: see above description
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

RCCS15

General: Purplish-red, highly siliceous material with occasional very small dark vugs. The coloration grades imperceptibly into weak purplish-red to almost colorless zones.
Munsell Color Notation: A Munsell color match could not be found. Pantone color 683c (R:125, G:33, B:74) is the closest match for the primary color.
Translucency: moderately to highly translucent
Luster: vitreous to earthy
Texture: cryptocrystalline

RCCS16

General: Dusky red (7.5R 4/4) to slightly more brownish-red (10R 5/6) with occasional dark specks.
Munsell Color Notation: see above description.
Translucency: slightly translucent.
Luster: vitreous to waxy
Texture: cryptocrystalline

RCCS17

General: Slight pinkish cast to an otherwise milky to colorless matrix with reddish-brown (10R 4/8) swirls and cloudy areas.
Munsell Color Notation: see above description
Translucency: moderately to highly
Luster: waxy
Texture: cryptocrystalline

RCCS18

General: Lightly mottled shades of pinkish-gray (10R 8/4) and light grayish-red (10R 7/4).
Munsell Color Notation: see above description
Translucency: opaque to slightly translucent.

Luster: earthy to greasy
Texture: cryptocrystalline

RCCS19

General: Highly siliceous light red cast with numerous dark red inclusions.
Munsell Color Notation: 10YR 3/6 to 2.5Y N/8 (primary) *Translucency*: moderately to highly translucent.
Luster: vitreous
Texture: cryptocrystalline

RCCS20

General: Red (10R 5/8) with fine, slightly darker red (10R 4/6) banding.
Munsell Color Notation: 10R 5/8 (primary) with 10R 4/6 banding
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

RCCS21

General: Weak red (10R 4/4) to red (10R 4/6) with pinkish-white swirls, lines, and spots that appear to be highly siliceous limestone inclusions. Dark specks occur infrequently.
Munsell Color Notation: 10R 4/4 (primary)
Translucency: opaque
Luster: earthy to resinous
Texture: microcrystalline

RCCS22

General: Fairly uniform dark red (10R 3/6) and vitreous. When held to a light source, numerous speck-size colorless (highly translucent) areas can be seen.
Munsell Color Notation: 10R 3/6 (primary)
Translucency: slightly
Luster: vitreous
Texture: cryptocrystalline

RCCS23

General: Mottled dark reddish-brown (2.5YR 3/4) and weak red (2.5YR 5/2) with occasional pinkish-white spots.
Munsell Color Notation: 2.5YR 3/4 to 2.5YR 5/2 (primary)
Translucency: opaque to slightly
Luster: waxy to vitreous
Texture: cryptocrystalline

RCCS24

General: Pinkish chert that ranges from pink (7.5YR 7/4) to red (2.5YR 4/6) with occasional dark specks.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

CCS25

General: Weak red (10R 4/3) with dark reddish-gray (10R 3/1) banding. Occasional small vugs in some pieces. Material is dull in luster and almost grainy in appearance, but not to the touch.
Munsell Color Notation: 10R 4/3 (primary)
Translucency: opaque
Luster: earthy
Texture: microcrystalline

RCCS26

General: Red (7.5R 4/8) CCS that transitions to yellowish-red with intermittent dark red specks and dendritic inclusion—some of which cluster.
Munsell Color Notation: 7.5R 4/8 (primary)
Translucency: slightly to moderately
Luster: vitreous
Texture: cryptocrystalline

RCCS27

General: Blackish-red (2.5R 4/2) with numerous beige (5YR 8/4) specks that give a densely speckled appearance.
Munsell Color Notation: see above
Translucency: opaque
Luster: earthy to waxy
Texture: cryptocrystalline

RCCS28

General: Moderately bright red (Pantone color C:18, M:100, Y:193, K:11 is the closest match for the primary color) CCS with slightly darker specks, spots, and cloudy areas.
Munsell Color Notation: see above
Translucency: slightly to moderately
Luster: vitreous to waxy
Texture: cryptocrystalline

RCCS29

General: Purplish-red, highly siliceous material with infrequent and subtle bluish-gray smears.
Munsell Color Notation: A Munsell color match could not be found. Pantone color 9C2D4B (R:156, G:45, B:75) is the closest match for the primary color.
Translucency: moderately translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

RCCS30

General: Uniform colored and textured dark reddish-gray (10R 3/1) chert.
Munsell Color Notation: 10R 3/1
Translucency: opaque to slightly translucent
Luster: waxy to greasy
Texture: cryptocrystalline

RCCS31

General: Mottled weak red (7.5R 4/4) with occasional colorless or off-white zones.
Munsell Color Notation: 7.5R 4/4 to 7.5R 5/4
Translucency: moderately
Luster: waxy to vitreous
Texture: cryptocrystalline

RCCS32

General: Pinkish-white with pink to light-red (2.5R6/8-2.5R 5/8) vein-like lines and smears.
Munsell Color Notation: See above description
Translucency: slightly
Luster: waxy to vitreous
Texture: cryptocrystalline

RCCS33

General: Very dusky red (2.5R 3/4), uniform colored chert/chalcedony
Munsell Color Notation: 2.5R 3/4
Translucency: opaque to slightly translucent
Luster: earthy
Texture: microcrystalline

RCCS34

General: Dusky red (10R 3/2) chert with occasional pale red (10R 6/2) spots and smaller dark specks.
Munsell Color Notation: 10R 3/2
Translucency: opaque
Luster: slightly waxy
Texture: cryptocrystalline

RCCS35

General: Broadly banded chert that is dark red (10R 3/6), reddish gray (10R 6/1), and brown (7.5YR 4/2) with occasional reddish black lines (10R 2.5/1) separating the different colors.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: slightly waxy
Texture: cryptocrystalline

RCCS36

General: Pinkish or reddish-brown (2.5YR 5/4) with occasional dark red (10R 3/6) specks.
Munsell Color Notation: see above description
Translucency: opaque to slightly
Luster: slightly resinous to slightly waxy
Texture: cryptocrystalline to microcrystalline

RCCS37

General: Weakly colored reddish-yellow (7.5YR 6/8) to red (10R 4/6) to almost colorless chert.
Munsell Color Notation: see above description
Translucency: moderately
Luster: slightly resinous to slightly waxy
Texture: cryptocrystalline to microcrystalline

RCCS48

General: Dusky red (10R 3/3) chert with infrequent pale red (10R 6/2) and black (2.5YR N2.5/) specks, spots, or streaks.
Munsell Color Notation: See above description.
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

RCCS56

General: Weak red (10R 5/2) with dark reddish-gray (10R 3/1) bands and/or specks. Cortex is mottled dark red (10R 3/6) and light red (2.5YR 6/6).
Munsell Color Notation: see above description
Translucency: opaque
Luster: slightly resinous to slightly waxy
Texture: microcrystalline to cryptocrystalline

White to Brownish-White to Grayish-White-to Beige

WCCS1

General: Highly siliceous material that abruptly changes colors from whitish (10YR 8/1), to light gray (5YR 7/1), to yellowish-brown (10YR 5/6), to weak red (2.5YR 5/2) with occasional red (2.5YR 4/6) to dusky red (10R 3/3) streaks, swirls, and splotches, and occasional gray specks throughout the matrix.
Munsell Color Notation: See above description
Translucency: slightly translucent
Luster: waxy to vitreous
Texture: cryptocrystalline to fine crystalline

WCCS2

General: Highly siliceous material that is a light gray (10YR 7/1) in color with occasional light gray microcrystals and dark reddish-brown (2.5YR 3/4) specks, streaks, and smears in the matrix.
Munsell Color Notation: See above description
Translucency: opaque
Luster: waxy to greasy
Texture: cryptocrystalline

WCCS3

General: Opaque white with some areas that grade to a slight bluish-gray. Some areas contain black specks—individually or clustered.
Munsell Color Notation: N/A
Translucency: opaque
Luster: earthy to slightly waxy
Texture: cryptocrystalline

WCCS4

General: Faint mixing/mottling of beige (2.5 Y 9/2), pinkish-beige (7.5YR 8/6), and yellowish-gray (10YR 7/8) with occasional dark specks.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

WCCS5

General: White to milky white colored material that exhibits occasional faint tannish and light gray zones and smears.
Munsell Color Notation: See above description.
Translucency: opaque to slightly translucent
Luster: waxy
Texture: cryptocrystalline

WCCS6

General: Light beige with faint, small cloudy areas of a light gray (10YR 8/2) and numerous dark brown specks.
Munsell Color Notation: see above description.
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

WCCS7

General: Highly siliceous material that exhibits faint mottling/mixing of whitish gray (2.5Y 8.5/4) and yellowish gray (primary) (10YR 7/6) and dark yellowish-brown (10YR 6/8).
Munsell Color Notation: see above description.
Translucency: opaque
Luster: waxy to vitreous
Texture: cryptocrystalline

WCCS8

General: Highly siliceous material that exhibits slight mottling/mixing of milky white to light gray (10YR 6/2) to yellowish-gray (10YR 7/6) with occasional dark specks.
Munsell Color Notation: see above description.
Translucency: opaque to slightly translucent
Luster: waxy
Texture: cryptocrystalline

WCCS9

General: Highly siliceous material that exhibits mottling/mixing of whitish (10YR 8/1 or 10YR 8/2) and grayish (10YR7/1 or 10YR 6/1) colors some specimens grade into mottled whitish (10YR 8/1 or 10YR 8/2) to very pale browns (10YR 7/3 or 10YR 7/4). Occasional very small, yellowish-red spots (5YR 4/6) in the matrix.
Munsell Color Notation: see above description.
Translucency: opaque to slightly
Luster: waxy to vitreous
Texture: cryptocrystalline

WCCS10

General: Highly siliceous whitish (10YR 8/1) material with frequent red to dark red (10R 4/6 or 10R 3/6) spots and zones.
Munsell Color Notation: see above description.
Translucency: opaque
Luster: waxy to earthy
Texture: cryptocrystalline

WCCS11

General: Highly siliceous to grainy, off-white (10YR 8/2) to light gray (10YR 7/2) in primary color. Some specimens exhibit occasional faint red (2.5YR 4/6) smears in the matrix.
Munsell Color Notation: see above description.
Translucency: opaque
Luster: waxy to resinous
Texture: cryptocrystalline to micro-crystalline

WCCS12

General: Highly siliceous material that exhibits mottling/mixing of white/off-white and light brownish-gray (2.5Y 6/2).
Munsell Color Notation: see above description.
Translucency: moderately
Luster: waxy to slightly resinous
Texture: cryptocrystalline

WCCS13

General: White opaque material with large zones of moderately translucent, pale brown (10YR 6/3) with frequent white spots and specks.
Munsell Color Notation: see above description

Translucency: white areas are opaque to slightly translucent. Pale brown zones are moderately translucent
Luster: waxy
Texture: cryptocrystalline

WCCS14

General: Beige to pale-yellowish-gray (10YR 9/1) with areas of light-brown (7.5YR 5/6).
Munsell Color Notation: see above description
Translucency: slightly translucent
Luster: waxy to earthy
Texture: cryptocrystalline

WCCS15

General: Blended or mixed gray (10YR 7/2), pale-gray (10YR 9/1), and grayish-yellow (10YR 8/4) with dark specks.
Munsell Color Notation: see above description
Translucency: opaque
Luster: waxy
Texture: cryptocrystalline

WCCS16

General: Reddish-gray (5R 8/1) with purplish-red lines, splotches, and specks. Weathers to an opaque beige color.
Munsell Color Notation: see above description.
Translucency: opaque
Luster: waxy to slightly resinous
Texture: cryptocrystalline

WCCS17

General: Beige (10YR 9/1) with faint lavender (5R 6/4) zones.
Munsell Color Notation: see above description
Translucency: opaque
Luster: slightly waxy
Texture: cryptocrystalline

WCCS18

General: Highly siliceous material that exhibits mottling/mixing of white/off-white and light brownish-gray (2.5Y 6/2) with zones/cloudy areas of dark gray (2.5Y N4/) to very dark gray (2.5Y N3/). Specimens used here are Swan River chert.
Munsell Color Notation: see above description.
Translucency: opaque to slightly
Luster: waxy to slightly resinous
Texture: cryptocrystalline to microcrystalline

WCCS19

General: Off-white with a slight pinkish cast.
Munsell Color Notation: see above description.
Translucency: opaque
Luster: earthy to greasy
Texture: cryptocrystalline

Colorless to Milky

CCCS1

General: Clear to slightly milky.
Munsell Color Notation: colorless to 7.5YR N8/
Translucency: moderately to highly translucent
Luster: vitreous to resinous
Texture: cryptocrystalline

CCCS2

General: Clear to slightly milky highly siliceous material that grades imperceptibly to gray. Some specimens exhibit a very slight reddish-brown cast in the matrix as well.
Munsell Color Notation: colorless to 7.5YR N8/ to 7.5YR N5/
Translucency: moderately to highly translucent
Luster: vitreous to earthy
Texture: cryptocrystalline

CCCS3

General: Colorless to slightly milky highly siliceous material with brown to black dendritic specks and/or fern-like inclusions (a.k.a., moss agate). *Munsell Color Notation*: colorless to 7.5YR N8/
Translucency: moderately to highly translucent
Luster: vitreous to resinous
Texture: cryptocrystalline

CCCS4

General: Colorless but thoroughly milky/cloudy (agate-like).
Munsell Color Notation: see above description
Translucency: moderately translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

CCCS5

General: Colorless to slightly milky highly siliceous material with occasional weak red (10R 4/4) or black spots and specks (agate-like). *Munsell Color Notation*: see above
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

CCCS6

General: Light gray to brownish-gray (10YR 6/2) with a mixture of opaque-white, reddish-brown or yellowish-brown smears/zones and occasional dark, white, and/or dark red (10R 3/6) specks, spots, and streaks.
Munsell Color Notation: see above
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

CCCS7

General: Colorless to milky, highly siliceous material with frequent dark yellowish-brown (10YR 4/4 to 10YR 4/6) streaks, smears, and cloud-like inclusions (agate-like).
Munsell Color Notation: see above
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

CCCS8

General: Colorless to milky, highly siliceous material with frequent dark red (10R 3/6) bands that give a pinkish cast to the whole. Some portions of the same core may not have the red bands and appear only as pinkish.
Munsell Color Notation: see above
Translucency: moderately to highly translucent
Luster: vitreous to waxy
Texture: cryptocrystalline

CCCS9

General: Generally colorless to slightly milky with a faint brownish cast when held to a light source. Contains numerous black dendritic inclusions (specks, smears, or cloudy zones), and occasional reddish-brown smears and whitish spots.
Munsell Color Notation: see above
Translucency: moderately to highly translucent
Luster: earthy to waxy
Texture: cryptocrystalline

Limestone and mudstone

This category includes fine to medium grained varieties of silica rich limestone and mudstone. They may contain silicified gastropod remains and chert inclusions.

Pale Yellow to Tan

SLM1

General: Fine to medium grained and moderately siliceous although not tool quality. Chert veins are common within the matrix and range in color from pale yellow (2.5Y 7/4) to dark brown (7.5YR 3/4).
Specimens may or may not contain silicified gastropod shells.
Munsell Color Notation: primary- 2.5Y 7/4
Translucency: opaque
Luster: resinous
Texture: medium-fine crystalline

Olive gray to green

SLM4

General: Fine grained, siliceous mudstone. Pale olive (5Y 6/3) to light olive gray (5Y 6/2) in color with areas that transition to pale yellow (5Y 7/3).
Munsell Color Notation: see above
Translucency: opaque
Luster: earthy
Texture: microcrystalline

Siliceous sediment and highly siliceous sandstone

This category includes very fine grained, siliceous, clastic sedimentary rock made up almost exclusively of micro-quartz sand cemented with secondary silica. These materials can include very small chert grains or minerals such as zircon, tourmaline, and magnetite (Bates and Jackson 1980). Sources of siliceous sediments in Montana have

been positively identified southeast of Great Falls in the Sand Coulee/Stockett/Centerville area, and throughout the Tongue River drainage and Fallon and Carter Counties (a.k.a, orthoquartzite or Tongue River Silicified Sediment).

It has also been identified as float in the sediments between Judith gap and Harlowton, and the Forest Grove area. Similar looking material is also known from southwest Alberta as Beaver River sandstone.

Siliceous sediment: mottled or swirled light gray, dark gray, pinkish-gray, and grayish brown

OQZT2

General: Highly siliceous sandstone presently referred to as orthoquartzite, it is very similar to some variants of Tongue River Silicified Sediment (SE Montana SW North Dakota). This material is generally uniform textured, lacks vugs and inclusions, is very fine grained, and its primary color is mottled or swirled, light gray and dark gray to very dark gray.
Munsell Color Notation: primary- 2.5Y 7/2 and 7.5YR N4/ to 7.5YR N3/
Translucency: opaque
Luster: resinous to slightly vitreous
Texture: very-fine crystalline to microcrystalline

Sedimentary quartzite (a.k.a quartz sandstone)

This category includes fine to coarse crystalline varieties of quartz rich sandstone common among the glacial tills of northern Montana. These materials are commonly referred to in the archaeological literature as quartzites, however, they are not true quartzites as they are not metamorphosed.

grayish-red to maroon

SDQZT1b

General: Uniform textured, moderately fine to medium grained, grayish-red to maroon colored material without inclusions.
Munsell Color Notation: 5R 4/2
Translucency: opaque
Luster: resinous
Texture: moderately fine to medium crystalline

light yellow to beige

SDQZT2d

General: Uniform textured and colored pale yellow (2.5Y 7/3) material.
Munsell Color Notation: 2.5YR 7/3 (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: fine to very-fine crystalline

SDQZT2e

General: Uniform textured and colored light yellow (10YR 6/4) to very pale brown (10YR 7/4) material.
Munsell Color Notation: 10YR 6/4 to 10YR 7/4
Translucency: opaque
Luster: resinous
Texture: very-fine crystalline

SDQZT2f

General: Uniform textured and colored light yellowish-brown (2.5Y 6/3) material with frequent dark specks.
Munsell Color Notation: 2.5YR 7/3 (primary matrix color)
Translucency: opaque

Luster: resinous
Texture: fine to very-fine crystalline

Light Brown to Dark Brown

SDQZT4b
General: Uniform textured, medium-fine to medium grained, yellowish-brown (10YR 5/4) colored material with occasional reddish-brown (5YR 4/3) spots and specks. Cortex is light yellowish-brown (10YR 6/4) with occasional reddish-brown (5YR 4/3) spots and specks.
Munsell Color Notation: 2.5Y 4/2 (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: medium crystalline

SDQZT4e
General: Uniform textured, medium-fine to medium grained, yellowish- brown (10YR 5/4) colored material with numerous black, very pale-brown (10YR 8/3) reddish-brown (5YR 4/3) spots and specks. Cortex mirrors interior colors.
Munsell Color Notation: 10YR 5/4 (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: medium crystalline

SDQZT4m
General: Fine to medium fine-grained yellowish brown (Pantone color C:4 Y:27 M: 100 K: 0) material with occasional dark gray (10YR 4/1) spots and specks.
Munsell Color Notation: See Pantone notation above (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: Fine to medium fine crystalline

Whitish-Gray to Dark Gray

SDQZT5a
General: Uniform textured, fine to medium-fine grained, very light gray (2.5Y N8/) to light gray (2.5Y N7/) material with frequent reddish-brown (5YR 4/3) spots, specks and streaks. Cortex color is similar to interior material color. The study specimen is Flathead Quartzite. *Munsell Color Notation*: 2.5Y N8/ to 2.5 YR N7/ (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: fine to medium-fine crystalline

SDQZT5e
General: Uniform textured and colored, fine to medium-fine grained, dark gray (5Y 4/1) material with a slight olive hue.
Munsell Color Notation: 5Y 4/1 (primary matrix color)
Translucency: opaque
Luster: resinous
Texture: fine to medium-fine crystalline

SDQZT5f
General: Gray to light gray and generally uniformly textured and colored, although some pieces range to red. Occasional to frequent reddish-brown specks in the matrix. Fine to medium-fine grained.

Munsell Color Notation: 10YR 7/1, 10 YR 6/1 or 2.5Y 6/1 (primary matrix color); 10R 4/6 to 10R 4/8 (secondary matrix color)
Translucency: opaque
Luster: resinous
Texture: very fine to medium-fine crystalline

SDQZT5j
General: Uniform textured and colored, fine to medium-fine grained, very dark gray with a very slight purplish cast (2.5YR N3).
Munsell Color Notation: 2.5YR N3 (closest primary matrix color)
Translucency: opaque
Luster: resinous
Texture: fine to medium-fine crystalline

SDQZT5k
General: Uniform textured and colored, fine to medium-fine grained, whitish gray to light gray (5YR 7/1).
Munsell Color Notation: 5YR 7/1 (closest primary matrix color)
Translucency: opaque
Luster: resinous
Texture: fine to medium-fine crystalline

APPENDIX 7

Faunal Analysis

Faunal Remains
from the MacHaffie Site (24JF0004),
Montana City, Montana

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April 2022

The MacHaffie Site (24JF0004) is located at Montana City, Montana. Analysis of a total of 1,276 complete and fragmented faunal remains from the site are the result of excavations over several decades. The majority of the faunal material was analyzed by T. Weber Greiser and identified to genus, species, element, and side, where appropriate, if sufficient diagnostic landmarks were present. In addition, any butchering activities were noted. The recent analysis took place following the final round of site excavations under the direction of Patrick Rennie. Dr. Jack Fisher analyzed select bison and canid bones for Dr. Les Davis in 1991 and 2000 (Fisher 1991, 2000), some of which Davis submitted for radiocarbon dating.

To aid with identification, curator Angela Hornsby, Ph. D., facilitated access to the collection of contemporary comparative fauna housed at the Philip L. Wright Zoological Museum, Division of Biological Sciences, University of Montana. In addition, various illustrated guides of animal crania and post-crania were used (Brown and Gustafson 1979, France 2009, Hoffman and Pattie 1968, Lawrence 1951, Olsen 1964). Also, review of Kerry Foresman's *Mammals of Montana* (Foresman 2012) helped identify contemporary mammals in the general area and their current names, genus, and species.

Faunal remains from Folsom Component levels

The Folsom Component contained 611 complete bones and fragments weighing a combined total of 1,508.69gms. Identifiable species include Bison (*Bison* sp.), wolf (*Canis lupus*), mountain lion (*Puma* (formerly *Felis*) *concolor*) or lynx/bobcat (*Lynx spp*.), rabbit (*Sylvilagus* spp.), Richardson's ground squirrel (*Urocitellus richardsonii*), and black-tailed prairie dog (*Cynomys ludovicianus*). Mountain goat (*Oreamnos americanus*), big horn sheep (*Ovis canadensis*), mountain lion (*Puma* (formerly *Felis*) *concolor*), and mule or white-tailed deer (*Odocoileus* spp.) may also be represented. Much of the bone available for study is considered "scrap" in that it is too fragmentary to positively identify to skeletal element or species. It could represent a variety of large, medium or small mammals and birds.

Ungulates

The greatest number of identifiable ungulate bones and bone fragments from these levels identified as Bison, or probably Bison, total 199. The identifiable bones and fragments include a skull fragment, a horn core fragment, skull fragments, a right upper molar (#187), tooth enamel fragments, a hyoid fragment, a petrus bone (#81), a thoracic vertebra (#184), vertebrae fragments, rib fragments, a proximal scapula fragment, a radius fragment, large metacarpal[1] and metatarsal (#199) fragments - both with green breaks, carpals (#313), a second phalange (#53), and a sesamoid (#174).

Due to the fragmentary nature of the Bison bone from these levels, it is difficult to determine if more than one adult is represented in the Folsom levels. The only evidence of butchering observed on the ungulate bones is the green break on a distal metacarpal (#198) perhaps

[1] This left distal metacarpal (#198) from Level 17 fits proximal metacarpal fragments (#197) from Cody level 15, both in XU 6S/2W.

for marrow extraction. Medium-size ungulate bones identified in these levels consist of a deer femur fragment (#324) and either a bighorn sheep or mountain goat axis vertebra (#188).

Carnivores

Carnivore remains identified in the Folsom levels, some of which were initially identified by Jack Fisher (Fisher 2000) as large canid, are only those that are quite close in size to wolf (*Canis lupus*) in the P. L. Wright Zoological Museum comparative collection. These 47 remains include a tooth and 2 mandible fragments, a lumbar and 2 caudal vertebrae, scapula, humerus, left and right radius, ulna, 2 carpals, femur, patella, tibia, fibula, 6 metapodials, a tarsal, 12 phalanges, and 6 fragments unidentifiable to element. While fragmentary, many of the leg elements are identifiable to side and it appears only a single individual is represented by the remains. The long bones, vertebrae, metapodials, one phalange, and the fragments all appear to have green breaks indicating butchering. The only complete bones are carpals, tarsals, and many of the phalanges. All bones except one phalange were recovered from Excavation Unit (XU) 2000C; the single phalange was from 6S/2W, several meters to the southeast. It is likely that the outlier phalange is from the same individual as the other canid bones.

Les Davis (Davis et al 2010:134-135) cites sources for the consumption of dogs and wolf/dog hybrids among late precontact and early contact Plains Tribes during times of stress when other food sources such as bison were not available. What appears to be butchering of a wolf at the MacHaffie Site may be evidence for the practice among Paleoindians on the Northwestern Plains.

Other than a rabbit skeleton from the Helena component, the wolf remains comprise the most complete animal skeleton recovered from the excavation units at the site. While a number of the wolf bones are broken, there is no clear evidence of butchering.

A probable Felid calcaneum (#315) is identified in XU N2/W5, one of the units excavated by Forbis in 1951. The identification is tentative since it is very similar to other Felids but is smaller than a mountain lion and larger than a lynx or bobcat, which it most closely resembles.

Rabbits and Rodents

Rabbit hind leg bones and a metapodial are identified in this component. There is not enough skeletal material to determine if these bones are related to the cultural occupation or are from a rabbit that died on or near the site.

As many as three Richardson's ground squirrels are represented in the faunal remains from this component. The remains consist of two partial skeletons and a mandible with an incisor. The remains most likely represent individuals that excavated burrows into the cultural occupation levels in which they died.

Faunal Remains from Cody Component Levels

The levels identified as Cody contained 263 complete bones and fragments weighing a combined total of 3,718.45gms. Identifiable species include: Bison (*Bison* sp.), beaver (*Castor canadensis*), hare (*Lepus* spp.), rabbit (*Sylvilagus* spp.), and vole (*Arvicolinae* (formerly

Microtinae) spp.). Others too fragmentary to positively identify may include: mountain goat (*Oreamnos americanus*), big horn sheep (*Ovis canadensis*), wolf (*Canis lupus*), and mountain lion (*Puma* (formerly *Felis*) *concolor*). The most fragmented bones may be from other large or medium mammals, small mammals, and/or birds.

Ungulates

The overwhelming majority of 113 identifiable ungulate bones and bone fragments from the Cody levels are Bison or probably Bison. The identifiable bones and fragments include rib fragments, a caudal vertebra, scapula fragments, humerus fragments, a complete radius and fragments, an ulna fragment, a metacarpal[2] fragment, a carpal, femur fragments, a proximal tibia, a proximal metatarsal, and tarsals. The more complete Bison bones from these levels indicate that only one adult is represented in the Cody levels.

Evidence of butchering observed on the bison bones consists of an impact hole in a complete radius, likely from a hammerstone and the mid-shaft or longitudinal green breaks on five other leg bones (Table 1). It is assumed that the impact to the radius and the breaks on the other bones were part of the marrow extraction process.

Table 1: Bison bone from the MacHaffie Site Cody Levels with green breaks

Record #	Excavation Unit	Excavation Level	Excavation Depth	Skeletal Element	Skeletal Side	Completeness	Comments
177	8S/2W	15	140-150cm BS	Radius	left	complete	Probable hammerstone 3 x 15cm hole, anterior surface
195	8S/2W	16	150-160cm BS	Radius	right	proximal half	Longitudinal green break
318	N2/W2	6	70-80cm BS	Ulna	left,	distal shaft	Green break, mid-shaft
197	6S/2W	15	140-150cm BS	Metacarpal	left	proximal	Green break (see footnote)
196	2000-C	8	140-160cm BS	Tibia	right	proximal	Green break, possible carnivore gnawing
202	8S/4W	14	130-140cm BS	Metatarsal	right	proximal	Green break, mid-shaft (probably articulates with #203, calcaneus)

The only medium-size ungulate remains identified in these levels consists of a 3rd lower molar (#181) of either a bighorn sheep or mountain goat.

Rabbits and Rodents

The partial rabbit skeleton (#274) recovered from N1/W1, Level 6 includes a right maxilla and mandible, both humerii, and a left femur. These remains may either represent an animal

[2] These left proximal metacarpal fragments (#197) fit the distal metacarpal (#198) from Folsom level 17, both in XU 6S/2W.

occurring at the site as a result of hunting by the occupants or it may be parts of an animal that died naturally there.

A large beaver incisor enamel fragment (#260) was recovered from XU S1/W3, Level 6, 80-90 cm BS. It is possible that this incisor fragment comes from the same individual as the large beaver incisor fragment (#259) recovered from XU S1/W4, Level 4, 50 - 60cm BS - currently identified as a level of the Helena component. Both are from units excavated by Forbis in 1951. These beaver incisor fragments indicate use of beaver by the site occupants and may represent evidence of the use of the incisors as tools at various times at the site. While there is wear at the ends of the incisors, it is unclear if it is natural or cultural.

A mandible with an incisor, a second incisor, and fragments of a probable third Arvicolinae (formerly Microtinae) rodent were recovered from these levels. The remains most likely represent individuals that either lived in or excavated burrows into the cultural occupation levels in which they died.

Faunal remains from Helena Component levels

The Helena Component contained 474 complete bones and fragments weighing a combined total of 1,276.5gms. Identifiable species include: Bison (*Bison bison*), mountain lion (*Puma* (formerly *Felis*) *concolor*), mule or white-tailed deer (*Odocoileus* spp.), beaver (*Castor canadensis*), jack-rabbit or snowshoe hare (*Lepus* spp.), rabbit (*Sylvilagus* spp.), ground squirrel (Urocitellus spp.), and vole (*Arvicolinae* spp.). Others too fragmentary to positively identify may include: mountain goat (*Oreamnos americanus*), big horn sheep (*Ovis canadensis*), and wolf (*Canis lupus*). And even more fragmented bones may be from other large or medium mammals, small mammals, and/or birds.

Ungulates

As with the lower two levels at the site, the count of 251 represents more than half of the identifiable ungulate bones and bone fragments from the Helena levels are Bison or probably Bison. The identifiable bones and fragments include skull fragments, teeth, rib fragments, vertebrae, scapula fragments, humerus fragments, tibia fragments, a proximal metatarsal, and a first phalange. The more complete Bison bones from these levels indicate that only as many as three individuals are represented in the Helena levels.

Evidence of butchering observed on the bison bones consists of the mid-shaft or longitudinal green breaks on leg bones (Table 2). It is assumed that the breaks on the long bones were part of the marrow extraction process.

The only medium-size ungulate remains identified in these levels are from mule or white-tailed deer and consist of a lower first molar (#172), a partial right humerus (#323) from an immature individual, a partially fused distal left tibia (#330), and left astragalus (#211). It is possible these bones are from the same individual since they all came from the west half of the site and recovered with during Forbis' 1951 excavations or Davis' 2000 excavations.

Table 2: Bison bone from the MacHaffie Site Helena Levels with green breaks

Record #	Excavation Unit	Excavation Level	Excavation Depth	Skeletal Element	Skeletal Side	Completeness	Comments
122	2S/0E	3	20-30cm BS	proximal metatarsal	left		Sub-adult, green break
135	14S/2E	5	40-50cm BS	navicular cuboid	right		Heavily weathered
136	14S/2E	6	50-60cm BS	astragalus	right		Heavily weathered
144	Test C	3	40-60cm BS	1st phalange	left,	complete	Large, older animal
146	Test C	3	40-60cm BS	2nd upper premolar	right	complete	Heavily worn
150	Test C	4	60-80cm BS	anterior mandible	left,	fragment	Bag includes skull fragments
154	Test C	5	80-100cm BS	humerus or femur cylinder	side N/A		Badly weathered, immature (?)
179	2000-B	5	80-100cm BS	lumbar vertebra		large fragment	Unfused epiphysis
182	2000-B	5	80-100cm BS	4 lumbar (?) epiphyses			Unfused
224	N2/W4	2	10-20cm BS	horn core tip fragment	side N/A		Young animal
230	N1/5W	1	10-20cm BS	upper 2nd & 3rd premolars	left		Heavily worn
240	N1/6W	2	20-30cm BS	proximal tibia	left		Unfused
241	N1/6W	2	20-30cm BS	acetabulum	left		Fused, adult

Carnivores

A probable *Puma* (formerly *Felis*) *concolor* - mountain lion - patella (#159) was recovered from XU 98 South Block (the actual unit is not identified), one of the units excavated by Davis in 1998. The identification is tentative, but it most closely resembles mountain lion skeletal material in the P.L. Wright Museum collections.

Hares, Rabbits, and Rodents

A larger number of other small mammal bones occur in these levels perhaps because these levels are closer to the ground surface and since they are more recent, preservation may be better. A mandible (#149) and a single metatarsal (#148) of what is likely a hare, are either from a white-tailed jackrabbit or a snowshoe hare.

Remains representing as many as six either desert or mountain cottontails were recovered from the Helena levels. These include a nearly complete skeleton (#228), two mandibles (#9 and #145), and two tibias (#225 and #229), from as many as three individuals. These remains may either represent animals occurring at the site because of hunting by the occupants of the site or they may be parts of animals that died naturally there.

A large beaver incisor enamel fragment (#259) was recovered from XU S1/W4, Level 4, 50-60 cm BS. It is possible that this incisor fragment comes from the same individual as the large beaver incisor fragment (#260) recovered from XU S1/W3, Level 6, 80-90 cm BS – currently identified as a level of the Cody component. Both are from units excavated by Forbis in 1951. These beaver incisor fragments indicate use of beaver by the site occupants and may represent evidence of the use of the incisors as tools at various times at the site. While there is wear at the ends of the incisors, it is unclear if it is natural or cultural.

Bones from two *Arvicolinae* (formerly *Microtinae*) rodents recovered from these levels include a right mandible with an incisor (#130), a second right mandible (#131), and right femur. The remains most likely represent individuals that either lived in or excavated burrows into the cultural occupation levels in which they died.

A ground squirrel pelvis and femur (#214) are also in the faunal remains from this component. The remains are too deteriorated to be able to identify species or side. The remains may represent consumption by occupants of the site or are from an individual that excavated a burrow into the cultural occupation levels in which it died.

Reptiles

Nineteen vertebrae of what appears to be a snake were located in a1951 Forbis XU S1/W5. No comparative skeletons are available to try to identify the snake. The partial unit was located along the edge of the old stream channel.

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MacHAFFIE SITE (24JF4)

Jack Fisher
15 January 1991

Scottsbluff Layer: Measurements of *Bison* skeletal elements for SEX determination.

I. Skeletal Elements that were Measured:

Catalog No.	Element
24JF4-8S4W-SB-1	Humerus (left), distal end, epiphysis fused
24JF4-8S2W-SB-9, 8a	Radius (left), complete, all epiphyses fused
24JF4-6S2W-SB-5, 4	Metacarpal (left), proximal end, epiphysis fused
MH-89B-54, Obj. 2	Metacarpal (left), distal end, epiphysis fused, conjoins above listed proximal end
24JF4-8S4W-SB-2, 2	Tibia (right), distal end, epiphysis fused
24JF4-8S4W-SB-2, 1	Metatarsal (right), proximal end, epiphysis fused

II. Measurements taken:

The humerus, radius, and tibia were measured using measurements presented and defined by L. C. Todd in the book The Horner Site (1987), Academic Press.

The metacarpal and metatarsal were measured using measurements presented and defined by J. N. Bedord in the book The Casper Site (1974), Academic Press.

Measurements are given here in mm.

Element	Measurement	Value (mm)	Comments
Humerus	HM7	(92.0)	eroded surface; could be 97.0
	HM11	110.1	
Radius	RD2	359.0	
	RD4	99.5	
	RD7	100.0	
	RD9	53.2	
	RD11	(65.0)	styloid broken; could be larger
Metacarpal	1	221.0	
	2	81.9	
	3	49.2	
	4	(85.0)	eroded surface; could be larger
	5	34.7	
	7	51.5	
	8	47.0	
Tibia	TA7	83.0	
	TA10	64.0	
Metatarsal	2	63.2	
	6	62.1	

III. Comparisons

The measurements of the MacHaffie humerus, radius, and tibia were compared to the Horner site bison (presented by L. C. Todd in The Horner Site), which date to the Cody Complex and, thus, are presumably of similar

antiquity to the MacHaffie specimens. All three MacHaffie bones fall into the Horner mature male bison category (the MacHaffie measurements were plotted on the appropriate plots presented by Todd for the Horner bison).

The measurements of the MacHaffie metacarpal and metatarsal were compared to Finley site bison (Finley data presented by Bedord in The Casper Site), as Finley also dates to the Cody Complex. The MacHaffie specimens fall within the size of the larger of the Finley bison, implying that the MacHaffie specimens are male. In addition, the MacHaffie metacarpal falls into the male range of a plot of Finley bison, which plots the transverse width of the metacarpal against "Ratio 6" (Ratio 6 for the MacHaffie metacarpal is [49.2 ÷ 221.0] x 100 = 22.26).

DECEMBER 4, 2000

MACHAFFIE SITE
2000 Excavation

IDENTIFICATION OF SELECTED ARCHAEOLOGICAL BONE SPECIMENS

by Jack Fisher

All Specimens Listed Here are from Provenience: 2KC, Level 10, 180–200 cm, 8/21/00, OH

Taxon: large canid (larger than modern coyote [*Canis latrans*])

- metacarpal V, right side, proximal end + about ½ of diaphysis
  maximum height: 13.35 mm
  maximum breadth: 13.90 mm
  (see original, handwritten sheet for illustration of measurements)

- metapodials, distal end + less than ½ of diaphysis
  could be metacarpal II, left side; or could be a metatarsal
  greatest breadth (Bd) of distal end (see Von Den Driesch, p. 95): 11.68 mm
  greatest height of distal end: 12.30 mm
  (see original, handwritten sheet for illustration of "greatest height" measurement)

- fibula, left side, distal end and a short length of adjoining diaphysis
  maximum anterior–posterior depth of epiphysis: 14.68 mm
  maximum later–medial breadth of epiphysis: 8.08 mm
  (see original, handwritten sheet for illustration of measurements)

- 4th tarsal (cuboid?), right side, complete
  maximum length (proximal–distal): 21.63 mm
  maximum breadth (lateral–medial): 18.40 mm
  maximum height (anterior–posterior/cranial–caudal): 17.54 mm

- ulnar carpal (pisiform?), left side, complete
  maximum length: 24.60 mm
  maximum width (perpendicular to length): 14.91 mm
  maximum thickness: 10.62

- caudal vertebra, complete except some small projections broken off
  maximum length: 28.00 mm
  minimum breadth (diameter) of diaphysis: 7.20 mm

- mandible, right side, fragment of mandibular symphysis and adjoining parts of alveoli for incisors, canine, p1, and p2

maximum height of symphyseal surface (from ventral border to dorsal edge): 21.89 mm

- vertebra, lumbar (or possibly terminal thoracic vertebra), fragmentary, posterior zygopophyses and adjoining bone
  maximum breadth across paired posterior zygopophyses: 17.97 mm

- mandible, right side, fragment of mandibular condyle

Taxon: probably large canid, but identification is not conclusive

- tooth, fragment of root of molariform tooth

- metapodial?, diaphysis fragment (short piece of shaft cylinder)

Taxon: possibly *Bison*, but identification is not conclusive

- fragment of tooth enamel
- fragment of possible hyoid

Taxon: indeterminate; large canid–sized to deer–sized to bison–sized

- 11 specimens of "long bone end" fragments (placed together in a ziploc bag)
- 18 specimens of long bone shaft and possible rib shaft (placed together in a ziploc bag)
- some 2–dozen or 3–dozen fragments of unidentified bone (placed together in a ziploc bag)

MacHaffie Site (24JF4)
2000 Excavation, Directed by Dr. Leslie B. Davis (Museum of the Rockies)

Identification of Selected Archaeological Bone Specimens
by Jack Fisher
September 25, 2000

• 2K6, Level 6, 100–120 cm, 8–21–2000, LB:

1. 3rd molar, mandibular; right. Hypsodont; base of roots is closed; complete except a bit of the medial side of the occlusal surface of the posterior–most cusp is missing. Infundibulum is present in the anterior and medial cusps, and is absent from posterior–most cusp.
   - Taxon: Pronghorn antelope (*Antilocapra americana*). The tooth is too small & gracile for bighorn sheep, and presumably also for mountain goat (do not have comparative specimen of goat to examine).

• 2KA, Level 7, 120–140 cm, 8–8–2000, LB:

1. Femur; right. Proximal end of diaphysis; proximal epiphyses missing—probably unfused; bone surface shows "billowy textured" area where head of femur and greater trochanter would fuse onto diaphysis; but, some of these furrows could be carnivore tooth marks.
   - Taxon: Uncertain, in part because of apparently osteologically young age of the individual, and absence of "rugose" adult features. Possibly bear. Conceivably large artiodactyl (e.g., juvenile bison).

• 2KA, Level 8, 140–160 cm, 8–8–2000, SJ:

1. Naviculo–cuboid; right. Broken into 3 pieces, 2 of which conjoin. Missing about ⅓ of total specimen; missing piece is wedge–shaped, most of posterior part of bone, extending into the center of the naviculo–cuboid.
   - Taxon: Probably *Bison*.

• 2KA, Level 9, 160–180 cm, 8–9–2000, SJ:

1. Vertebra. Fragment of body (ventral portion). Probably thoracic vertebra; probably vertebra T–9 or thereabouts, based on pronounced lateral compression of body.
   - Taxon: Probably *Bison*.

2. Fragment of transverse process of vertebra; could be part of above vertebra.

• 2KA, Level 11, 200–220 cm, 8–12–2000, EH & ML:

1. Maxillary molar; left. Much of tooth is present; missing part of occlusal surface and all of medial surface.
   - Taxon: *Bison*

2. 5 small pieces of tooth; could well be part of above tooth.

3. Axis vertebra? If so, the specimen consists of a small fragment the dens and adjacent bone.
   - Taxon: Ungulate? Deer–sized? Seems too small for bison.

4. 3 fragments of bone; unidentified to skeletal element or to taxon.

Selected Bones from the MacHaffie Site (24JF4): 2001 Excavations

Jack Fisher

June 7, 2018

The following animal bones were provided to Fisher by Dr. Leslie B. Davis for analysis. These bones were recovered during excavations in 2001 directed by Les Davis. A brief description of these bones is provided below. The provenience information and dates provided below is written on the outside of each baggie. These bones have been submitted to Patrick Rennie and will subsequently become part of the MacHaffie Site collection at the University of Montana, Missoula

- Unit 2000-C
  160-180 cm BS
  Folsom
- 8/4-6/01

Three baggies contain a single bone each. The other five baggies each contain < 50 fragmentary pieces of bone. Some of these bone fragments are canid.

- Unit 2000-C
  180-200 cm
  Folsom
  8/21/00

Eleven baggies that each contain a single bone. Some are canid bones. Three other baggies each contains multiple bone fragments.

- Unit 2000-4
  160-180 cm BS
- Folsom
- 8/6/2001

A fragmentary long bone shaft of a deer-sized animal. There is possible rounding on some edges of this fragment. Possible bone artifact.

Also, a partial cranium of a rodent and a partial cranium of a small animal (shrew??).

- Unit C-9
- 140-160 cm BS
- N Wall
  Scottsbluff
- 8/24/01

Glenoid cavity (articular end) and neck of a scapula, bison.

- Unit C-6
  131 cm BS
- Scottsbluff
- 8/21/2001

Possible caudal vertebra of a bison-sized animal.

- Unit 2000-C
- 2 ft BS (approx)
- Helena Component
- West Wall
  8/3/01

The distal half of a tibia of an artiodactyle that is the size of deer-pronghorn-bighorn sheep.

24JF4 (MacHaffie Site): Folsom Component Faunal Remains

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
8	6S/6W	90-100cm BS	2	lower leg	*Sylvilagus* (rabbit) spp.	metapodial	indeterminate	fragment
11	4N/8E	200-210cm BS	2	scrap	bison or other large mammal	indeterminate	indeterminate	fragments
12	4N/8E	200-210cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragments
13	4N/8E	200-210cm BS	2	scrap	indeterminate	indeterminate	indeterminate	fragments
18	8S/2W	160-170cm BS	10	scrap	small mammal	indeterminate	indeterminate	fragment
20	6S/2W	180-190cm BS	10	scrap	small mammal or bird	indeterminate	indeterminate	fragments
25	6S/2W	90-100cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragment
26	6S/2W	160-170cm BS	10	scrap	bison (?)	rib ?	indeterminate	fragment
27	6S/2W	160-170cm BS	10	scrap	bison (?)	rib ?	indeterminate	fragments
28	6S/2W	160-170cm BS	10	leg	small mammal or bird (?)	long bone	indeterminate	fragment
29	6S/2W	160-170cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragment
30	6S/2W	170-180cm BS	10	lower leg	Canis lupus	2nd phalange	right	complete
34	6S/2W	190-200cm BS	10	skull	bison (?)	tooth enamel	indeterminate	fragment
35	6S/2W	210-220cm BS	10	scrap	medium or large mammal	long bone	indeterminate	fragment
39	C-5	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
40	C-5	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
41	C-5	180-200cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragment
42	C-5	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
43	C-5	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
44	C-5	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
45	C-6	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
46	C-8	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
47	C-3	180-200cm BS	3	scrap	bison	horn core	indeterminate	fragments
48	C-3	180-200cm BS	3	skull	bison	molar	indeterminate	fragment
49	C-3	180-200cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragment
50	C-3	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragment
51	C-2	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
52	C-2	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
53	C-2	160-180cm BS	3	lower leg	bison	2nd phalange	indeterminate	fragment

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
8		3	1	0.25	Diagnostic bone - metacarpal or metatarsal
11		2	3	9.75	
12		3	28	20.35	Includes a probable incisor fragment
13		4	58	6.00	Very fragmented
18	One end is possibly cut	3	1	0.20	Diagnostic bone
20		4	26	0.75	Diagnostic bone? Mineral staining or slightly burned, long bone fragments.
25		3	1	0.25	
26		2	1	1.70	
27		3	8	3.75	
28		3	1	0.25	Diagnostic bone, mineral staining or slightly burned
29		4	12	0.80	
30		2	1	1.55	Diagnostic bone, wolf, weathered or acid etched; probably related to other wolf bones
34		3	1	0.25	Mineral stained?
35		3	1	0.95	
39		4	4	0.45	
40		3	2	0.75	
41		2	3	5.05	Long bone shank frags.; 2.0 - 2.1ft deep (BS not BD): converted to 60 - 64cm deep. Labeled as II-101 on original bag.
42		3	23	8.75	
43		4	2	0.20	
44		3	1	0.40	
45		3	4	1.10	
46		3	1	1.40	
47	Bone was heavily weathered prior to burial	1	2	12.80	Horn core frags
48		2	1	3.55	Large enamel fragment
49					
50					
51					
52					
53					

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
54	C-2	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragment
55	C-2	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
56	C-2	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
57	C-2	220-240cm BS	3	skull	bison	tooth enamel	indeterminate	fragments
58	C-2	220-240cm BS	3	scrap	bison	indeterminate	indeterminate	fragments
61	C-4	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragment
62	C-4	180-200cm BS	3	upper leg	small mammal or bird (?)	distal humerus	indeterminate	fragment
63	C-4	180-200cm BS	3	upper leg	small mammal	front leg?	indeterminate	complete
64	C-4	200-220cm BS	3	skull (?)	bison (?)	skull (?)	N/A	fragment
65	C-4	200-220cm BS	3	scrap	bison	indeterminate	indeterminate	fragments
66	C-4	200-220cm BS	3	axial	rodent (?)	skull	N/A	fragment
67	C-4	200-220cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
68	C-4	220-240cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragment
69	C-4	220-240cm BS	3	skull	bison (?)	tooth enamel	indeterminate	fragments
70	C-4	220-240cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
71	C-4	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
72	C-4	180-200cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
74	C-8	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
75	C-8	180-200cm BS	3	lower leg	small or medium mammal	carpal ?	indeterminate	complete
76	C-8	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
77	C-7	160-180cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragments
78	C-7	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
79	C-7	160-180cm BS	3	lower leg	small mammal (?)	tarsal ?	indeterminate	fragment
80	C-7	180-200cm BS	3	scrap	bison (?)	rib (?)	indeterminate	fragments
81	C-9	160-180cm BS	3	skull	bison	petrus bone	right	complete
82	C-9	160-180cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragments
83	C-9	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
84	C-9	160-180cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
86	C-1	160-180cm BS	3	scrap	bison	indeterminate	indeterminate	fragments
87	C-1	200-220cm BS	3	scrap	small mammal	indeterminate	indeterminate	fragment
88	C-1	240-260cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
98	4S/0E	160-170cm BS	10	axial	bison	vertebral	N/A	fragment

24JF4 (MacHaffie Site): Folsom Component Faunal Remains

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
54		3	22	4.00	Burned and unburned bone fragments, 4 mostly coated in red ochre.
55		4	4	0.50	
56		3	7	1.70	
57		3	17	10.80	
58	Bone appears to have weathered prior to burial	2	6	22.05	
61		3	13	4.00	
62		3	1	0.20	Diagnostic bone
63		3	1	0.35	Diagnostic bone
64		2	1	3.65	
65		2	6	15.10	
66		3	1	0.05	Diagnostic bone, base of cranium
67		3	7	3.25	Long bone shank frag
68		2	1	1.15	
69		3	2	0.40	
70		3	1	0.35	
71		3	7	0.60	
72		4	6	0.65	
74		4	6	0.65	
75		2	1	1.35	Diagnostic bone
76		3	4	2.55	
77		2	4	6.45	
78		3	6	2.15	
79		3	1	0.30	Diagnostic bone
80		2	2	2.40	Ochre stained
81		2	1	13.60	Diagnostic bone
82		2	4	6.60	
83		3	18	6.60	
84		4	2	0.20	
86		3	1	1.20	
87		3	1	0.20	Diagnostic bone
88		3	2	2.10	
98		1	1	5.55	

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
99	4S/0E	160-170cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
109	0N/0E	160-170cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
110	0N/0E	170-180cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
112	4S/0E	170-180cm BS	10	leg	bison	lower limb bone	indeterminate	fragments
132	2S/0E	90-100cm BS	10	skull	*Urocitellus richardsonii*	mandible and	right	complete
137	14S/2E	90-100cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
138	2S/0E	160-170cm BS	10	lower leg	bison (?)	metatarsal (?)	indeterminate	distal end fragment
174	6S/2W	170-180cm BS	10	lower leg	bison	sesamoid	indeterminate	complete
175	6S/2W	170-180cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
176	98 South	200-210cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
184	2000-A	160-180cm BS	4	axial	bison	thoracic vertebra	N/A	complete ?
185	2000-A	160-180cm BS	4	axial	bison	rib ?	indeterminate	fragment
187	2000-A	220-240cm BS	4	skull	bison	maxillary molar	right	complete
188	2000-A	220-240cm BS	4	axial	*Ovis* or *Oreamnos*	axis vertebra	N/A	fragment
189	2000-A	220-240cm BS	4	scrap	bison	indeterminate	indeterminate	fragments
190	2000-A	220-240cm BS	4	skull	bison	tooth enamel	indeterminate	fragments
191	2000-A	220-240cm BS	4	scrap	indeterminate			fragments
192	2000-A	220-240cm BS	4	skull	bison (?)	tooth enamel/roots	indeterminate	fragments
366	98 South	200-210cm BS	5	lower leg	bison	radius	right	distal end fragment
198	6S/2W	160-170cm BS	10	lower leg	bison	metacarpal	left	distal end
199	6S/2W	160-170cm BS	10	lower leg	bison	metatarsal	left	proximal end fragment
206	98B	250-260cm BS	4	partial skeleton	*Urocitellus richardsonii* (?)	various	both	N/A
207	97B	250-260cm BS	4	partial skeleton	*Urocitellus richardsonii* (?)	various	both	N/A
212	N1/W3	90-100cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragments
217	S1/W5	90-100cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
221	N3/W4	120-130cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragment
223	S1/E1	120-130cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
242	S1/W5	100-110cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
252	S1/W5	90-100cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
263	N1/W5	100-110cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragment

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
99		3	8	1.70	
109		3	2	0.20	
110		3	1	0.20	Burned ?
112		1	3	53.80	Original bag was labeled 24JF4-4S0E-SSB5. A 7mm diameter hole was recently bored into the fragment. Uncertain what the bone dust sample was intended for.
132		3	1	0.20	Diagnostic bone
137		3	2	1.20	
138		2	1	3.40	Diagnostic bone - heavy mineral staining, crystallization
174		3	1	0.95	Diagnostic bone
175		3	9	3.00	
176		2	1	2.30	Long bone shank fragment
184		1	1	74.70	Diagnostic bone; mineralized.
185		1	1	11.20	Diagnostic bone; proximal 1st rib fragment (?), mineralized.
187		1	1	48.35	Diagnostic bone; crown damage
188		2	1	5.95	Diagnostic bone
189		2	7	8.25	5 bone fragments, 2 tooth fragments, mineralized
190		2	3	3.25	tooth enamel fragments, mineralized
191		3	5	3.10	bone fragments, mineralized
192		3	5	2.50	tooth fragments, mineralized
366		1	1	19.25	Diagnostic bone; unfused epiphysis, sub-adult
198		1	1	251.00	Diagnostic bone; mid-shaft green break, fits #197
199		1	1	96.00	Diagnostic bone; longitudinal mid-shaft green break
206		3	16	2.10	Diagnostic bones; probably ground squirrel - fragmented skull, some front and back leg bones. Likely intrusive.
207		3	10	1.70	Diagnostic bones; probably ground squirrel, postcranial - right scapula, humerus, femur, and tibia (unfused epiphyses), 4 ribs.
212		3	2	0.50	3.2 - 3.4ft deep (BS not BD): converted to 97 - 104cm deep
217		2	1	4.90	3.2ft deep (BS not BD): converted to 97cm deep
221		3	1	0.15	4.1ft deep (BS not BD): converted to 125cm deep (black soil)
223		3	7	6.60	Some mineralization; 4ft deep (BS not BD): converted to 122cm deep (black soil)
242		3	1	0.40	Long bone shank fragment; 3.5ft deep (BS not BD): converted to 107cm deep
252		2	1	1.80	Long bone shank fragment; 3.1ft deep (BS not BD): converted to 94cm deep

24JF4 (MacHaffie Site): Folsom Component Faunal Remains

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
263	N1/W5	100-110cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragment
265	N2/W3	140-150cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
267	N1/W5	110-120cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
267	N1/W5	110-120cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
273	N1/W2	130-140cm BS	11	hind leg	*Sylvilagus* spp.	femur and tibia	left	fragments
276	N1/W1	110-120cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
285	S1/W5	90-100cm BS	11	axial	bison	vertebra	indeterminate	fragment
286	N2/W3	120-130cm BS	11	scrap	medium mammal	indeterminate	indeterminate	fragments
288	N2/W1	130-140cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
291	S1/W5	90-100cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
292	S1/E3	120-130cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
295	N2/W5	90-100cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
296	N2/W5	90-100cm BS	11	axial	bison	rib	indeterminate	fragment
297	N2/W5	90-100cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
304	S1/W5	110-120cm BS	11	scrap	medium mammal?	indeterminate	indeterminate	fragments
306	N1/W5	130-140cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragments
309	S1/W5	100-110cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragment
313	S1/W4	90-100cm BS	11	lower leg	bison	carpal	right	complete
315	N2/W5	90-100cm BS	11	lower leg	*Felix rufus* (lynx)	calcaneum	?	complete
319	S1/W5	90-100cm BS	11	upper leg?	*Cynomys ludovicianus* (black-tailed prairie dog)	humerus + 2nd bone	?	fragments
320	2000-4	160-180cm BS	4	scrap	bison (?)	indeterminate	indeterminate	fragments
321	2000-C	180-200cm BS	4	skull	*Sylvilagus* spp. (?)	mandible	left	fragment
322	2000-C	180-200cm BS	4	upper leg	small mammal	femur?	?	fragment
324	2000-C	180-200cm BS	4	upper leg	*Odocoileus* (?)	femur (lesser trochanter)	right	fragment
325	2000-C	180-200cm BS	4	lower leg ?	medium mammal	indeterminate	indeterminate	fragments
326	2000-C	180-200cm BS	4	upper leg	bison (?)	scapula proximal	right	fragment
328	2000-C	180-200cm BS	4	axial	bison (?)	hyoid(?)	indeterminate	fragment
329	2000-C	180-200cm BS	4	lower leg	bison (?)	carpals	left	complete
331	2000-C	180-200cm BS	4	lower leg	*Canis lupus* **	metapodial diaphysis		fragment
332	2000-C	180-200cm BS	4	skull	*Canis lupus* **	tooth (molar)		fragment
333	2000-C	180-200cm BS	4	skull	*Canis lupus* **	mandible (condyle)	right	fragment

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Post-Processing	Size-Grade	Count	Weight (grams)	Comments
263		3	1	1.05	3.5ft deep (BS not BD): converted to 107cm deep. Labelled as "black layer" on original bag.
265		2	4	9.55	Long bone shank fragment; 4.6ft deep (BS not BD): converted to 140m deep. Labeled as I-54 on original bag.
267		2	9	21.50	Long bone shank fragment; 3.7ft deep (BS not BD): converted to 113cm deep. Labeled as I-5 on original bag.
267		3	10	15.00	Elements not complete, but identifiable; 3.4ft deep (BS not BD): converted to 134cm deep. Labeled as I-3 "bird bones" on original bag.
273	root damage	1	1	16.80	Long bone shank fragment; 3.9ft deep (BS not BD): converted to 119 cm deep. Labeled as I-6000 on original bag.
276		1	1	5.50	Epiphysis fragment; 3.1ft deep (BS not BD): converted to 94cm deep. Labeled as I-7 on original bag.
285		3	2	3.40	Long bone shank fragments; 4.0ft deep (BS not BD): converted to 122cm deep. Labeled as I-57 on original bag.
286		2	1	1.85	Long bone shank fragment; 4.5ft deep (BS not BD): converted to137cm deep. Labeled as I-53 on original bag.
288		2	1	4.10	Long bone shank fragment; 3.1ft deep (BS not BD): converted to 94cm deep. Labeled as I-7 on original bag.
291		2	1	2.70	Long bone shank fragment; 4.1ft deep (BS not BD): converted to 125cm deep. Labeled as I-6 on original bag.
292		1	1	10.65	Long bone shank fragment; 3.15ft deep (BS not BD): converted to 96cm deep. Labeled as I-21 on original bag.
295		2	1	14.30	3.3ft deep (BS not BD): converted to 100cm deep. Labeled as I-22 on original bag.
296		2	1	4.60	Long bone shank fragment; 3.15ft deep (BS not BD): converted to 96cm deep. Labeled as I-21 on original bag.
297		3	3	2.20	Long bone shank fragments; 3.9ft deep (BS not BD): converted to 119cm deep. Labeled as I-46 on original bag.
304		3	6	2.70	fragments; 3.4ft deep (BS not BD): converted to 134cm deep. Labeled as I-5 on original bag.
306		2	1	4.05	fragment; 3.6ft deep (BS not BD): converted to 110cm deep. Labeled as I-14 on original bag.
309		1	1	29.55	3.3 ft deep (BS not BD): converted to 100 cm deep. Labeled as I-42 on original bag.
313		1	1	9.60	3.1 ft deep (BS not BD): converted to 94 cm deep. Labeled as I-1 on original bag.
315		3	2	1.60	3.2 ft deep (BS not BD): converted to 98 cm deep. Labeled as I-16 "bird bones" on original bag.
319		3	8	4.00	
320		3	1	0.60	includes P2, M1, M2 teeth
321		3	1	0.05	Fetal or immature
322		2	1	3.65	JF 1-24-02
324		3	9	3.20	
325		1	1	214.00	
326		3	1	1.35	
328		1	1	40.20	smaller than full adult
329		3	1	1.10	Phalange diaphysis?; Original bone missing?
331		3	1	1.80	enamel and root
332		2	1	3.30	green break
333		1	1	10.30	green break

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
334	2000-C	180-200cm BS	4	skull	*Canis lupus* **	mandible (symphysis)		fragment
335	2000-C	180-200cm BS	4	lower leg	Canis lupus **	fibula (distal end)	left	fragment
336	2000-C	180-200cm BS	4	lower leg	Canis lupus **	ulnar carpal	left	complete
337	2000-C	180-200cm BS	4	upper leg	Canis lupus **	femur (distal condyle)	left	fragment
338	2000-C	180-200cm BS	4	lower leg	Canis lupus **	fibula (distal end)	?	fragments
339	2000-C	180-200cm BS	4	lower leg	Canis lupus **	4th tarsal (cuboid)	right	complete
340	2000-C	180-200cm BS	4	lower leg	Canis lupus **	metapodial (distal end)		fragment
341	2000-C	180-200cm BS	4	spine	Canis lupus **	lumbar vertebrae		fragment
342	2000-C	180-200cm BS	4	lower leg	Canis lupus **	metapodial V		fragment
343	2000-C	180-200cm BS	4	spine	Canis lupus **	caudal vertebrae		complete
346	6S/6W	90-100cm BS	2	scrap	medium or large mammal	rib	indeterminate	fragments
348	6S/6W	90-100cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
349	6S/6W	160-170cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
350	6S/6W	90-100cm BS	2	upper leg	bison (?)	indeterminate	indeterminate	fragment
352	2000-C	180-200cm BS	4	upper leg	Canis lupus **	scapula	left	fragment
353	2000-C	180-200cm BS	4	upper leg	Canis lupus **	humerus	right	fragment
354	2000-C	180-200cm BS	4	lower leg	Canis lupus **	ulna	left	fragment
355	2000-C	180-200cm BS	4	lower leg	Canis lupus **	radius	left	fragment
356	2000-C	180-200cm BS	4	lower leg	Canis lupus **	radius	right	fragment
357	2000-C	180-200cm BS	4	lower leg	Canis lupus **	tibia	left	fragment
358	2000-C	180-200cm BS	4	lower leg	Canis lupus **	radius	left	fragment
359	2000-C	180-200cm BS	4	lower leg	Canis lupus **	phalanges	indeterminate	complete & fragments
360	2000-C	180-200cm BS	4	axial	Canis lupus **	caudal vertebrae	N/A	complete
361	2000-C	180-200cm BS	4	lower leg	Canis lupus **	metapodial	indeterminate	fragments
362	2000-C	180-200cm BS	4	lower leg	Canis lupus **	carpal	indeterminate	complete
363	2000-C	180-200cm BS	4	indeterminate	Canis lupus **	indeterminate	indeterminate	fragments

24JF4 (MacHaffie Site): Folsom Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
334		2	1	1.15	green break
335		2	1	1.15	green break
336		2	1	1.30	
337		2	1	4.20	green break
338		2	3	5.75	green break
339		2	1	3.00	
340		2	1	1.80	green break
341		2	1	3.00	green break
342		2	1	3.50	green break
343		2	1	1.25	
346		3	7	5.40	
348		2	1	1.90	Long bone shank fragment
349		2	23	45.70	C-14 Sample 24JF4-2018-1; associated with Folsom point preform (projectile point #17)
350		1	3	51.90	possible epiphysis, heavily deteriorated; diagnostic bone
352		2	1	8.08	Proximal; acromium missing; green break
353		1	1	18.22	Distal; chops on lateral condyle; green break on shaft
354		1	1	14.90	Proximal; green break on shaft
355		1	1	10.31	Distal; green break on shaft
356		2	1	7.19	Proximal has chop marks; green break on shaft
357		1	1	10.54	Distal; green break on shaft
358		2	1	7.50	Proximal; green break on shaft
359		3	11	8.84	Phalanges - 5 - 1st, 4 - 2nd, 2 - 3rd; one with green break
360		3	2	2.40	
361		3	4	6.19	Possible cut marks; green break on shaft
362		2	1	1.74	
363		3	6	9.18	1 articulator end; 5 shaft fragments with green breaks
TOTAL			**611**	**1,508.69**	

24JF4 (MacHaffie Site): Cody Component Faunal Remains

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
1	8S/2W	150-160cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragment
10	6S/6W	100-110cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
16	8S/4W	140-150cm BS	10	upper leg	bison	upper limb bone fragment (humerus?)	indeterminate	fragment
17	8S/4W	150-160cm BS	10	upper leg	bison	upper limb bone fragment (humerus?)	indeterminate	fragment
19	2008-SBE	100-120cm BS	3	skull	*Arvicolinae*	mandible and incisor	left	fragment
31	6S/2W	150-160cm BS	10	scrap	bison	rib and long bone	indeterminate	fragments
32	6S/2W	150-160cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
33	6S/2W	150-160cm BS	10	scrap	medium mammal	indeterminate	indeterminate	fragment
36	C-5	140-160cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
37	C-5	140-160cm BS	3	skull	*Arvicolinae*	incisor	indeterminate	complete
38	C-5	140-160cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
59	C-4	140-160cm BS	3	scrap	small mammal or bird (?)	indeterminate	indeterminate	fragments
60	C-4	140-160cm BS	3	scrap	bison (?)	indeterminate	indeterminate	fragments
73	C-8	131-160cm BS	3	scrap	indeterminate	indeterminate	indeterminate	fragments
85	C-1	140-160cm BS	3	scrap	bison	indeterminate	indeterminate	fragments
95	4S/0E	110-120cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
96	4S/0E	150-160cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
97	4S/0E	150-160cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
111	2S/0E	140-150cm BS	10	leg	bison	upper limb bone fragment (femur or humerus)	indeterminate	fragment
157	98-South Block	150-160cm BS	5	axial	small mammal	vertebra		complete
158	98-South Block	150-160cm BS	5	scrap	indeterminate	indeterminate	indeterminate	fragment
160	98-South Block	110-120cm BS	5	scrap	medium mammal?	indeterminate	indeterminate	fragment
162	98-South Block	150-160cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
168	98-South Block	130-140cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
169	98-South Block	140-150cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
170	98-South Block	140-150cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
171	6S/2W	150-160cm BS	10	upper leg	bison	scapula	left	fragments
172	6S/4W	130-140cm BS	4	upper leg	bison	femur(?)	indeterminate	fragment

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
1		2	1	3.30	Long bone shank flake, mineral staining
10	One fragment appears	3	2	1.20	
16		1	1	45.20	Mineral staining, fits #17. Original bag was labeled 24JF4 - 8S4W - SB3. A 7mm diameter hole was recently bored into the fragment. Uncertain what the bone dust sample was intended for.
17		1	1	32.40	Light mineral staining, fits #16. Original bag was labeled 24JF4 - 8S4W - SSB7. A 7mm diameter hole was recently bored into the fragment. Uncertain what the bone dust sample was intended for.
19		3	1	0.10	Diagnostic bone
31		2	5	13.80	4 rib fragments (3 fit together), 1 long bone shank fragment - mineral stained or slightly burned
32		3	9	2.25	
33		4	5	0.45	
36		4	4	0.20	
37		3	1	0.10	Diagnostic bone
38		3	7	2.60	
59	Bone appears burned	3	4	0.50	
60	Bone appears burned	2	1	1.40	
73		4	2	0.20	
85		2	2	6.00	Partially mineralized
95		3	1	0.10	
96		3	3	1.40	
97		4	4	0.60	
111	root trails	1	1	44.35	Original bag was labeled 24JF4 - 2S0E - SB1. A 7mm diameter hole was recently bored into the fragment. Uncertain what the bone dust sample was intended for.
157		2	1	0.25	Diagnostic bone
158		3	1	0.70	
160		2	2	1.40	Long bone shank fragments, mineral stained
162		2	1	2.60	Long bone shank fragment
168		3	1	0.85	
169		2	1	1.00	
170		3	1	1.60	Long bone shank fragment
171		1	4	213.00	Diagnostic bone, 2 blade & 2 spine pieces
172		1	1	140.00	Diagnostic bone, large fragment with impact flake scar

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
173	6S/4W	140-150cm BS	4	axial	bison	rib	indeterminate	fragment
177	8S/2W	140-150cm BS	10	lower leg	bison	radius	left	complete
178	8S/2W	140-150cm BS	10	lower leg	bison	ulna?	left	fragments
181	2000-6	100-120cm BS	4	skull	*Ovis* or *Oreamnos*	3rd lower (?) molar	right	complete
365	2000-A	140-160cm BS	4	lower leg	bison	navicular cuboid	right	complete
183	2000-A	140-160cm BS	4	lower leg	bison	navicular cuboid	right	fragment
194	8S/2W	150-160cm BS	10	upper leg	bison	humerus	indeterminate	fragment
195	8S/2W	150-160cm BS	10	lower leg	bison	radius	right	proximal half
196	2000-C	140-160cm BS	4	lower leg	bison	tibia	right	proximal
367	6S/2W	140-150cm BS	10	lower leg	bison	metacarpal	left	proximal end
197	6S/2W	140-150cm BS	10	scrap	bison (?)	metacarpal	left	proximal end
200	8S/2W	140-150cm BS	10	lower leg	bison	lateral maleolus	right	complete
201	8S/2W	140-150cm BS	10	scrap	bison	indeterminate	indeterminate	fragments
202	8S/4W	130-140cm BS	4	lower leg	bison	metatarsal	right	proximal
203	8S/4W	130-140cm BS	4	lower leg	bison	calcaneus	right	complete
204	8S/4W	120-130cm BS	4	upper leg	bison	humerus	left	distal end
205	8S/4W	120-130cm BS	4	upper leg	bison	humerus	left	fragments
208	96 West Test	150-160cm BS	6	lower leg	bison	astragalus	left	complete
209	8S/2W	150-160cm BS	10	upper leg	bison	femur diaphysis		fragment
216	S1/W3	70-80cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
218	N1/W3	70-80cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
226	N1/W3	60-70cm BS	11	scrap	medium mammal (?)	indeterminate	indeterminate	fragments
231	S1/W1	60-70cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
232	S1/W3	70-80cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
243	S1/W3	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
254	N2/W1	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
256	S1/W3	80-90cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
173		1	1	31.00	Diagnostic bone, rib blade fragment
177		1	1	775.00	Anterior surface exhibits a marrow extraction hole that measures 15cm x 3cm. Hole was probably formed using a hammerstone. Diagnostic bone. Same as Fisher SB - 9, 8a. Good impact flakes, some mineral staining.
178		2	3	28.15	2 fragments ulna shaft & distal; 1 long bone shank fragment. Probably not ulna or radius
181		1	1	8.05	Diagnostic bone
365		1	1	24.00	Diagnostic bone; possible fit with #183, mineralized.
183		1	1	31.10	Diagnostic bone; possible fit with #182, mineralized.
194		1	2	143.60	2 large shank fragments - green breaks
195		1	1	184.00	Diagnostic bone; longitudinal green break
196		1	3	283.00	Diagnostic bone; 3 pieces (excavation damage?), green break, possible carnivore gnawing
367		1	1	142.00	Diagnostic bone; green break, fits #198. Same as Fisher SB - 5, 4
197		3	1	0.85	Diagnostic bone; green break, fits #198. Same as Fisher SB - 5, 4
200		1	1	14.40	Diagnostic bone; probable articulation with #203; mineralized
201		1	2	19.30	Long bone fragments
202		1	1	246.00	Diagnostic bone; probable articulation with #203; midshaft green break, some mineralization
203		1	1	214.00	Diagnostic bone; articulation with #202
204		1	1	627.00	Diagnostic bone; fits with #205; Same as Fisher SB - 1
205		2	3	21.00	Fits with #204
208	Some weathering of exterior surface.	1	1		Piece reportedly submitted by Leslie Davis for C - 14 dating, October 22, 1996
209		1	1		Piece reportedly submitted by Leslie Davis for C - 14 dating, May 1, 1997. Note references piece as 24JF4 - 8S2W - I-20.
216		2	1	3.80	Long bone shank fragment.; 2.4ft deep (BS not BD): converted to 73cm deep
218		2	4	16.00	Long bone shank fragment.; 2.4ft deep (BS not BD): converted to 73cm deep
226		3	7	3.35	2.2ft deep (BS not BD): converted to 67cm deep
231		2	1	2.60	Long bone shank fragment.; 2.6ft deep (BS not BD): converted to 79cm deep
232		3	3	2.65	Long bone shank fragment.; 2.3 - 2.4ft deep (BS not BD): converted to 70 - 73cm deep
243		3	1	0.70	Long bone shank fragment.; 0.2ft deep (BS not BD): converted to 6cm deep
254		2	2	52.15	Long bone shank fragment.; 2.3ft deep (BS not BD): converted to 70cm deep. Labeled IV-8 on original bag.
256		3	9	7.90	Long bone shank fragment.; 2.8ft deep (BS not BD): converted to 85cm deep

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
257	S1/W3	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
258	N1/W5	60-70cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragments
260	S1/W3	80-90cm BS	11	skull	*Castor candensis*	incisor	indeterminate	fragment
262	S1/W5	60-70cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
266	S1/W5	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
269	S1/W3	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
270	S1/W5	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
274	N1/W1	80-90cm BS	11	partial	*Sylvilagus* spp.	various	both	fragments
275	S1/W3	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
277	S1/W3	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
278	N2/W6	80-90cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
283	S1/W4	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
290	S1/W4	60-70cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragments
293	S1/W3	60-70cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
294	S1/W1	60-70cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
298	S1/W1	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
299	N1/W5	60-70cm BS	11	scrap	indeterminate	indeterminate	indeterminate	fragments
300	S1/W3	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
301	S1/W3	80-90cm BS	11	axial	bison	rib ?	indeterminate	fragment
303	S1/W3	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
307	S1/W1	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
308	S1/W1	70-80cm BS	11	skull	large mammal	cranium	indeterminate	fragment
311	S1/W3	70-80cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
312	N1/W2	80-90cm BS	11	skeleton	*Arvicolinae*	mixed	indeterminate	fragment
314	N1/W5	70-80cm BS	11	lower leg	bison	metapodial ?	indeterminate	fragment
316	S1/W3	60-70cm BS	11	lower leg	bison	carpal	right	complete
317	S1/W3	70-80cm BS	11	upper leg	bison	scapula ?	indeterminate	fragment
318	N2/W2	70-80cm BS	11	lower leg	bison	ulna	left	fragments
327	C-6	130-140cm BS	3	axial	bison (?)	caudal vertebra	N/A	complete
344	8S/6W	130-140cm BS	2	scrap	bison-size	indeterminate	indeterminate	fragments
345	8S/6W	150-160cm BS	2	lower leg	medium mammal	1st phalange - distal	indeterminate	fragment
347	8S/6W	140-150cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
351	8S/6W	140-150cm BS	2	scrap	medium or large mammal	indeterminate	indeterminate	fragments

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
257		2	1	5.80	Long bone shank frag.; 2.35ft deep (BS not BD): converted to 72cm deep. Labeled as II-50 on original bag.
258		4	13	0.70	2.2ft deep (BS not BD): converted to 67cm deep. Labeled as II-15 on original bag.
260		3	1	0.50	Just enamel; Worked ends - natural or cultural (?); Same individual as 259 ?; 2.9ft deep (BS not BD): converted to 88cm deep. Labeled as II-89 on original bag. Piece is distinct from #259.
262		3	1	1.05	Long bone shank frag.; 2.3ft deep (BS not BD): converted to 70cm deep. Labeled as II-69 on original bag.
266		3	4	6.80	Long bone shank frag.; 2.4ft deep (BS not BD): converted to 73cm deep.
269		2	1	2.25	Long bone shank frag.; 2.2ft deep (BS not BD): converted to 67cm deep. Labeled on original bag as II-59 "bird scapula (sheet 3) associated with upper F Layer".
270		2	5	11.95	Rib fragments; 2.3ft deep (BS not BD): converted to 70cm deep. Labeled as II-69 on original bag.
274		3	17	10.70	Right half maxilla, right mandible, both humerii, left femur; intrusive (?); 2.9ft deep (BS not BD): converted to 88cm deep. Labeled as "bird bones" on original bag.
275		2	1	2.95	Rib fragment.; 2.4 - 2.5ft deep (BS not BD): converted to 73 - 76cm deep. Labeled as II-82 on original bag.
277	broken after excavation	2	2	23.20	Long bone shank frags.; 2.0 - 2.1ft deep (BS not BD): converted to 60 - 64cm deep. Labeled as II-101 on original bag.
278		2	1	4.00	Long bone shank frag.; 2.75ft deep (BS not BD): converted to 84cm deep. Labeled as I-59 on original bag.
283		3	2	1.10	Long bone shank frags.; 2.2ft deep (BS not BD): converted to 67cm deep. Labeled as I-44 on original bag.
290		4	9	1.00	fragments; 2.2ft deep (BS not BD): converted to 67cm deep. Labeled as I-44 on original bag.
293		3	3	2.25	Long bone shank frags.; 2.59ft deep (BS not BD): converted to 79cm deep. Labeled as II-90 on original bag.
294		3	3	2.00	Long bone shank frags.; 2.2 - 2.3ft deep (BS not BD): converted to 67 - 70cm deep. Labeled as II-131 on original bag.
298		2	2	14.75	Long bone shank frags.; 2.2 - 2.3ft deep (BS not BD): converted to 67 - 70cm deep. Labeled as II-31 on original bag.
299		3	12	4.45	fragments; 2.2ft deep (BS not BD): converted to 67cm deep. Labeled as II-15 on original bag.
300		2	2	10.50	Long bone shank frags.; 2.59ft deep (BS not BD): converted to 79cm deep. Labeled as II-90 on original bag.

24JF4 (MacHaffie Site): Cody Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
301		2	1	6.60	fragment; 2.7ft deep (BS not BD): converted to 82cm deep. Labeled as II-112 on original bag.
303		1	1	16.55	Long bone shank frag.; 2.35ft deep (BS not BD): converted to 72cm deep. Labeled as II-50 on original bag.
307		2	1	14.45	Long bone shank frag.; 2.2 - 2.3ft deep (BS not BD): converted to 67 - 70cm deep. Labeled as II-29 on original bag.
308		1	1	10.60	Too fragmentary to identify; 2.3 - 2.4ft deep (BS not BD): converted to 70 - 73cm deep. Labeled as II-180 on original bag.
311		2	2	7.90	Long bone shank frag.; 2.4 - 2.5ft deep (BS not BD): converted to 73 - 76cm deep. Labeled as II-107 on original bag.
312		3	13	2.95	Very fragmented; 2.8ft deep (BS not BD): converted to 85cm deep. Labeled as II-8 on original bag.
314	post excavation breakage	1	2	24.40	Shank fragment; 2.4ft deep (BS not BD): converted to 73cm deep. Labeled as II-13 on original bag.
316		1	1	39.25	2.1 - 2.2ft deep (BS not BD): converted to 64 - 67cm deep.
317		2	1	5.30	2.5ft deep (BS not BD): converted to 76cm deep. Labeled as II-110 on original bag.
318	post excavation breakage	2	2	33.30	Distal shaft; older break is green break; 2.5ft deep (BS not BD): converted to 76cm deep. Labeled as II-5 on original bag.
327	shovel damage to transverse process	1	1	29.00	mature bison
344		2	9	9.65	
345		2	2	1.85	diagnostic bone
347	2	3	5.70		
351	3	20	5.85		
TOTAL			**263**	**3,718.45**	

24JF4 (MacHaffie Site): Helena Component Faunal Remains

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
2	6S/6W	70-80cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
3	6S/6W	70-80cm BS	2	scrap	medium or large mammal	indeterminate	indeterminate	fragments
4	6S/6W	20-30cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragment
5	6S/6W	20-30cm BS	2	scrap	medium or large mammal	indeterminate	indeterminate	fragments
6	6S/6W	40-50cm BS	2	scrap	bison (?)	indeterminate	indeterminate	fragments
7	6S/6W	40-50cm BS	2	scrap	medium or large mammal	indeterminate	indeterminate	fragments
9	6S/6W	70-80cm BS	2	skull	*Sylvilagus* spp.	mandible and incisor	left	distal
14	TU-1	20-30cm BS	3	scrap	medium size mammal	indeterminate	indeterminate	fragments
15	TU-1	10-20cm BS	3	scrap	medium size mammal	indeterminate	indeterminate	fragment
21	6S/2W	10-20cm BS	10	scrap	indeterminate	rib?	indeterminate	fragment
22	6S/2W	20-30cm BS	10	scrap	medium or large mammal	long bone?	indeterminate	fragments
23	6S/2W	30-40cm BS	10	scrap	bison (?)	long bone or rib?	indeterminate	fragments
24	6S/2W	80-90cm BS	10	scrap	small mammal or bird (?)	long bone	indeterminate	fragment
89	4S/0E	10-20cm BS	10	scrap	medium size mammal	rib?	indeterminate	fragment
90	4S/0E	20-30cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragment
91	4S/0E	30-40cm BS	10	leg	bison (?)	indeterminate	indeterminate	fragment
92	4S/0E	10-20cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragment
93	4S/0E	30-40cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragment
94	4S/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
100	0N/0E	0-10cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
101	0N/0E	10-20cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
102	0N/0E	10-20cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
103	0N/0E	20-30cm BS	10	scrap	medium size mammal	indeterminate	indeterminate	fragment
104	0N/0E	20-30cm BS	10	scrap	medium size mammal	indeterminate	indeterminate	fragment
105	0N/0E	30-40cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
106	0N/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
107	0N/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
108	0N/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
113	4N/0E	10-20cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
114	4N/0E	20-30cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
115	4N/0E	20-30cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
116	4N/0E	30-40cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
2		2	1	3.35	Rib fragment, mineral staining
3		3	9	4.9	Mineral staining
4		2	1	2.75	Mineral staining
5		3	6	4.1	Mineral staining
6		2	2	9.5	Rib fragments, mineral staining
7		3	7	5.55	Medium-large mammal ribs, mineral staining
9		2	1	0.8	Diagnostic bone - P3 in, P4 lose from distal mandible
14		3	2	1.05	
15		3	1	0.7	
21		3	1	0.15	
22		3	3	0.85	
23		3	2	13.5	1 fragment root etched, 1 mineral staining or slightly burned
24		3	1	0.15	
89		3	1	0.25	Possible polish
90		2	1	2.4	
91		1	1	13.3	Large cancellous fragment from long bone articulator end
92		2	2	3.2	
93	Bone was heavily weathered prior to burial	3	1	2.8	Long bone shank fragment
94	Heavily weathered	4	2	0.7	
100		3	4	4	
101		3	21	9.6	
102		4	2	0.5	
103		2	1	4.25	
104		4	3	1	
105		2	2	8.25	
106		4	21	1.6	
107		3	1	0.4	
108		4	5	0.65	
113		3	2	1	
114		2	3	13.25	Long bone shank fragments
115		3	3	1.55	
116		3	3	1.15	

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
117	2S/0E	0-10cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
118	2S/0E	10-20cm BS	10	skull (?)	bison (?)	skull (?)	indeterminate	fragment
119	2S/0E	10-20cm BS	10	scrap	medium or large mammal	indeterminate	indeterminate	fragments
120	2S/0E	10-20cm BS	10	scrap	bison (?)	tooth enamel	indeterminate	fragment
121	2S/0E	10-20cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
122	2S/0E	20-30cm BS	10	lower limb	bison	metatarsal	left	proximal end; green break
123	2S/0E	20-30cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragment
124	2S/0E	20-30cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
125	2S/0E	30-40cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
126	2S/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
127	2S/0E	30-40cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragment
128	2S/0E	40-50cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
129	2S/0E	40-50cm BS	10	scrap	indeterminate	indeterminate	indeterminate	fragments
130	2S/0E	30-40cm BS	10	skull	*Arvicolinae* spp.	distal mandible and incisor	right	fragment
131	2S/0E	80-90cm BS	10	upper leg	*Arvicolinae* spp.	femur	right	complete
133	14S/2E	0-10cm BS	10	scrap	medium and large mammal	indeterminate	indeterminate	fragments
134	14S/2E	30-40cm BS	10	skull	bison	maxillary molar	indeterminate	complete
135	14S/2E	40-50cm BS	10	lower leg	bison	navicular cuboid	right	complete
136	14S/2E	50-60cm BS	10	lower leg	bison	astragalus	right	complete
139	Test C	0-20cm BS	10	skull	bison	incisor	indeterminate	fragment
140	Test C	0-20cm BS	10	scrap	bison	indeterminate	indeterminate	fragments
141	Test C	0-20cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
142	Test C	20-40cm BS	10	scrap	bison	indeterminate	indeterminate	fragments
143	Test C	20-40cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
144	Test C	40-60cm BS	10	lower leg	bison	1st phalange	left	complete
145	Test C	40-60cm BS	10	scrap	bison	indeterminate	indeterminate	fragments
146	Test C	40-60cm BS	10	skull	bison	maxillary 2nd pre-molar	right	complete
147	Test C	40-60cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
148	Test C	40-60cm BS	10	lower leg	*Lepus* spp.	metatarsal	indeterminate	complete
149	Test C	40-60cm BS	10	skull	*Lepus* spp.	mandible	right	fragment
150	Test C	60-80cm BS	10	skull	bison	anterior mandible	left	fragments

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
117		2	2	3.6	Cancellous bone
118		2	1	2.7	Too small to identify
119		3	6	2.3	
120		3	1	0.35	
121		4	4	0.65	
122		1	1	28.25	Sub-adult. Original bag was labeled MH-89B-13, Object #4, #151.
123		2	1	2.2	
124		3	3	1.5	
125		2	2	2.4	
126		3	7	1.95	
127		3	2	0.7	
128		3	5	3.15	
129		4	17	1.4	
130		3	1	0.15	Diagnostic bone - anterior mandible
131		4	1	0.1	Diagnostic bone - meadow vole?
133		3	5	4	4 medium (2 fit together), 1 large, some weathering
134		2	1	7.25	Tooth is heavily worn. Original bag was labeled MH-89B-65, #238
135	Bone was heavily weathered prior to burial	1	1	10.4	Original bag was labeled MH-89B-66, #239
136	Bone was heavily weathered prior to burial	1	1	40.8	Original bag was labeled MH-89B-68, #241
139		3	1	1.25	Tooth root fragment
140		2	13	38.1	9 long bone shank fragments, 1 scapula blade fragment, 3 cancellous fragments
141		3	24	13.55	Small long bone shank, rib, and cancellous fragments
142	root trails. Some pieces showing	2	5	23	4 long bone shank fragments, 1 large upper rib blade fragment
143		3	7	2.95	Long bone shank and rib fragments
144	Badly weathered prior to being buried.	1	1	42.6	Diagnostic bone; large, older animal
145		2	5	6.95	4 long bone shank fragments, 1 cancellous fragment
146		2	1	9.8	Diagnostic as to side. Heavily worn tooth.
147		3	20	8	Long bone shank, vertebrae, and rib fragments
148		3	1	0.65	Diagnostic bone
149		3	1	1	Diagnostic bone
150		1	3	55.85	Diagnostic bone; mandible and skull fragments

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
151	Test C	60-80cm BS	10	skull?	bison	indeterminate	indeterminate	fragments
152	Test C	60-80cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
153	Test C	60-80cm BS	10	scrap	small mammal	indeterminate	indeterminate	fragments
154	Test C	80-100cm BS	10	upper leg?	bison	N/A	N/A	fragment
155	Test C	80-100cm BS	10	scrap	bison	indeterminate	indeterminate	fragments
156	Test C	80-100cm BS	10	scrap	bison (?)	indeterminate	indeterminate	fragments
159	98-South Block	10-20cm BS	5	lower leg	*Puma* (formerly *Felis*) *concolor* (probably)	patella	?	fragment
161	98-South Block	40-50cm BS	5	scrap	medium mammal?	indeterminate	indeterminate	fragment
163	98-South Block	20-30cm BS	5	scrap	indeterminate	indeterminate	indeterminate	fragments
164	98-South Block	60-70cm BS	5	scrap	indeterminate	indeterminate	indeterminate	fragment
165	98-South Block	50-60cm BS	5	scrap	medium mammal?	indeterminate	indeterminate	fragment
166	98-South Block	10-20cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragments
364	98-South Block	60-70cm BS	5	scrap	bison (?)	indeterminate	indeterminate	fragment
167	98-South Block	10-20cm BS	5	scrap	medium mammal?	indeterminate	indeterminate	fragments
179	2000-B	80-100cm BS	4	axial	bison	lumbar vertebra	N/A	major fragment
180	2000-B	80-100cm BS	4	scrap	medium or large mammal	indeterminate	indeterminate	fragments
182	2000-B	80-100cm BS	4	scrap	bison	indeterminate	indeterminate	fragments
186	2000-A	30-40cm BS	4	axial	medium mammal	rib	indeterminate	fragment
193	14S/2E	40-50cm BS	10	skull	*Arvicolinae* spp.?	mandible	right	fragment
210	S1/W4	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
211	N2/W4	40-50cm BS	11	lower leg	*Odocoileus* spp.	astragalus	left	complete
213	S1/W5	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
214	S1/W5	30-40cm BS	11	axial and upper	*Urocitellus* spp.	pelvis and femur		fragments
215	N1/W3	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
219	S1/W5	30-40cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
220	N1/W5	40-50cm BS	11	leg	small mammal	indeterminate	indeterminate	fragments
222	N2/W3	0-10cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
224	N2/W4	10-20cm BS	11	skull	bison (?)	horn core	indeterminate	fragment

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
151		1	3	55.85	Diagnostic bone; mandible and skull fragments
152		2	5	11.55	
153		3	29	12.05	Long bone shank and rib frags
154		4	5	0.65	
155	Badly weathered prior to being buried.	1	1	32.15	Diagnostic bone? Immature (?) humerus or femur cylinder; some mineral replacement
156		2	2	8.25	Long bone shank fragments
159		3	4	1.85	Long bone shank and rib fragments
161		2	1	4.3	Diagnostic bone
163		2	1	0.9	Long bone shank fragments, mineral stained
164		3	12	5.7	
165		3	1	0.15	
166		3	1	0.6	
364		2	2	2.75	Skull and rib fragments (?)
167		2	1	2.8	Long bone shank fragment
179		3	2	1.35	
180		1	1	7.1	Diagnostic bone; unfused epiphysis
182		3	8	5.45	Some mineral staining
186		2	9	19.65	Include 4 lumbar (?) vertebrae epiphyses
193		3	1	0.85	Diagnostic bone; rib blade fragment
210		3	1	0.15	Diagnostic bone
211		3	7	4.8	Mineralized (?); 1.7ft deep (BS not BD): converted to 52cm deep
213		1	1	18.15	1.3ft deep (BS not BD): converted to 40cm deep
214		2	1	4.2	Long bone shank frag.; 2ft deep (BS not BD): converted to 61cm deep
215		3	3	1.1	Rabbit or squirrel; 1.3ft deep (BS not BD): converted to 40cm deep
219		3	1	0.35	1.8ft deep (BS not BD): converted to 56 cm deep
220		2	1	4.8	Long bone shank frag.; 1.1 ft deep (BS not BD): converted to 33cm deep (from red soil)
222		3	2	0.8	1.4ft deep (BS not BD): converted to 43 cm deep
224		2	1	1.75	Long bone shank frag.; 0.1ft deep (BS not BD): converted to 3cm deep (top soil)

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
225	S1/E2	40-50cm BS	11	lower leg	*Sylvilagus* spp.	tibia	indeterminate	fragment
227	S1/W5	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
228	S1/W4	50-60cm BS	11	skeleton	*Sylvilagus* spp.	largely complete skeleton	N/A	N/A
229	S1/W5	50-60cm BS	11	lower leg	*Sylvilagus* spp.	tibia	indeterminate	fragments
230	N1/W5	10-20cm BS	11	skull	bison	maxillary premolars	left	complete
233	S1/W4	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
234	S1/W4	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
235	S2/W5	0-10cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
236	S1/W5	40-50cm BS	11	axial	snake (?)	spine	N/A	complete
237	N2/W2	10-20cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
238	S1/W4	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
239	S1/W5	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
240	N1/W6	20-30cm BS	11	lower leg	bison	tibia	left	fragments
241	N1/W6	20-30cm BS	11	axial	bison	acetabulum	left	fragment
245	N1/W2	40-50cm BS	11	skull	*Sylvilagus* spp. (?)	mandible	indeterminate	fragment
246	S1/W2	30-40cm BS	11	skull	indeterminate	mandible	indeterminate	fragment
247	S1/W2	40-50cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragments
248	N1/W5	10-20cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
249	S1/W3	60-70cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
250	S1/W1	30-40cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
251	S1/E3	40-50cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment
253	S1/W3	50-60cm BS	11	scrap	bison (?)	indeterminate	indeterminate	fragment

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
225		2	1	8.25	Tip of horn core; 0.6ft deep (BS not BD): converted to 18cm deep (horn core is from a young animal if bison)
227		3	1	0.5	Distal & half of shaft; 1.6ft deep (BS not BD): converted to 49cm deep
228		0		22.5	1.8ft deep (BS not BD): converted to 55cm deep
229		3	2	0.5	Distal and half of shaft; 1.8ft deep (BS not BD): converted to 55cm deep
230		2	2	16.8	PM 2 and 3; 0.4ft deep (BS not BD): converted to 12cm deep. Molars are heavily worn.
233		3	2	1.25	Long bone shank fragment;1.65 - 1.75ft deep (BS not BD): converted to 50 - 53cm deep
234		3	5	1.45	Long bone shank fragment;1.8-2 ft deep (BS not BD): converted to 50 - 53cm deep
235		3	1	0.7	Long bone shank fragment; burned or stained; 0.2ft deep (BS not BD): converted to 6cm deep
236		3	19	11	1.6ft deep (BS not BD): converted to 49cm deep. Largely complete snake (?) spine.
237		3	2	1.1	Long bone shank fragment; 0.5ft deep (BS not BD): converted to 15cm deep
238		3	1	0.3	Long bone shank fragment; 1.8 - 2.0ft deep (BS not BD): converted to 55 - 60cm deep
239		3	10	4.3	Long bone shank fragment; 2ft deep (BS not BD): converted to 60cm deep
240		1	2	166	Fused proximal epiphysis; probable green break; broken during excavation; 1.0ft deep (BS not BD): converted to 30cm deep
241		1	2	225	Fused, adult; possible green break; 1ft deep (BS not BD): converted to 30cm deep
245		3	1	0.4	1.6ft deep (BS not BD): converted to 49cm deep
246		2	1	3.8	1.3ft deep (BS not BD): converted to 40cm deep
247		3	1	0.25	too fragmentary to identify; 1.5 - 1.7ft deep (BS not BD): converted to 46 - 52cm deep
248		3	8	9.25	Long bone shank fragment; 0.6ft deep (BS not BD): converted to 18cm deep
249		3	1	1.75	Long bone shank fragment; 2.2ft deep (BS not BD): converted to 67cm deep
250		3	1	1.15	Long bone shank fragment; 1.3ft deep (BS not BD): converted to 40cm deep
251		3	1	1.3	Long bone shank fragment; 1.5ft deep (BS not BD): converted to 46cm deep
253		3	1	0.5	Long bone shank fragment; 2ft deep (BS not BD): converted to 60cm deep

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Excavation Unit	Excavated Depth	CMU	Gross Classification	Species	Skeletal Element	Skeletal Side	Completeness
255	S1/W4	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
259	S1/W4	50-60cm BS	11	skull	*Castor candensis*	incisor	indeterminate	fragment
261	S1/W1	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
264	S1/W5	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
268	S1/W4	50-60cm BS	11	scrap	medium mammal	indeterminate	indeterminate	fragments
271	S1/W5	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
272	S1/W3	50-60cm BS	11	skull	*Odocoileus* spp.	lower 1st molar	indeterminate	complete
279	S1/W4	50-60cm BS	11	scrap	medium mammal	indeterminate	indeterminate	fragment
280	S1/W4	40-50cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
281	S1/W4	50-60cm BS	11	scrap	bison	scapula?	indeterminate	fragments
282	S1/W3	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
284	S1/W4	40-50cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
287	N1/W5	50-60cm BS	11	axial	bison	rib?	indeterminate	fragment
289	S1/W3	40-50cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
302	S1/W4	50-60cm BS	11	skull	medium or small mammal	incisor?	indeterminate	complete
305	S1/W4	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
310	S1/W4	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
323	2000-C	20-40cm BS	11	upper leg	*Odocoileus* spp.	humerus	right	fragment
330	2000-C	60-80cm BS	11	lower leg	*Odocoileus* spp.	tibia	left	fragment
289	S1/W3	40-50cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
302	S1/W4	50-60cm BS	11	skull	medium or small mammal	incisor?	indeterminate	complete
305	S1/W4	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragments
310	S1/W4	50-60cm BS	11	scrap	bison	indeterminate	indeterminate	fragment
323	2000-C	20-40cm BS	11	upper leg	*Odocoileus* spp.	humerus	right	fragment
330	2000-C	60-80cm BS	11	lower leg	*Odocoileus* spp.	tibia	left	fragment

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
255		1	2	18.7	Long bone shank fragment;1.8 - 2.0ft deep (BS not BD): converted to 55 - 60cm deep
259		3	1	0.35	Just enamel; Worked ends - natural or cultural (?); Same individual as 260?; 1.85 - 1.95ft deep (BS not BD): converted to 56 - 59cm deep.
261		3	1	3	Long bone shank fragment; 1.7ft deep (BS not BD): converted to 52cm deep. Labeled on original bag as II-123.
264	broke in three pieces sometime after excavation	1	1	32.2	Long bone shank fragment; 2.0ft deep (BS not BD): converted to 60cm deep. Labeled as II-70 on original bag.
268		3	4	3.5	Long bone shank fragment, costal rib fragment; 1.7ft deep (BS not BD): converted to 52cm deep.
271		1	1	16.55	Long bone shank fragment; 2.0ft deep (BS not BD): converted to 60cm deep. Labeled as II-34 on original bag.
272	broke in two pieces sometime after excavation.	3	1	1.25	Minimal wear; 2.0ft deep (BS not BD): converted to 60cm deep.
279		3	1	0.65	1.8 - 2.0ft deep (BS not BD): converted to 55 - 60cm deep. Labeled as II-144 on original bag.
280		1	1	20.15	Long bone shank fragment;1.65ft deep (BS not BD): converted to 50cm deep. Labeled as II-40 on original bag.
281		2	3	16.35	1.8 - 2.0ft deep (BS not BD): converted to 55 - 60cm deep. Labeled as II-144 on original bag.
282		3	9	4.4	Long bone shank fragments; 1.9ft deep (BS not BD): converted to 58cm deep.
284		2	1	6.65	Long bone shank fragment; 1.65ft deep (BS not BD): converted to 50cm deep. Labeled as II-27 on original bag. Piece is either stained
287		2	1	2.75	2.2ft deep (BS not BD): converted to 67 cm deep. Labeled as II-15on original bag.
289		2	1	11.4	Long bone shank fragment; 1.55ft deep (BS not BD): converted to 47cm deep. Labeled as II-104 on original bag.

24JF4 (MacHaffie Site): Helena Component Faunal Remains (con't)

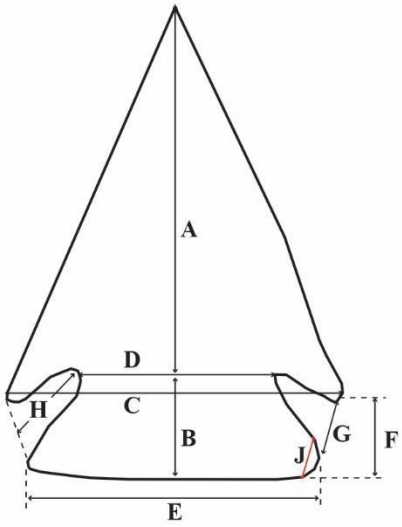
Record #	Post-Processing Damage	Size-Grade	Count	Weight (grams)	Comments
302		3	1	0.2	Deciduous?; 1.8ft deep (BS not BD): converted to 55cm deep. Labeled as II-63 on original bag.
305		2	4	17.7	Long bone shank fragments.; 1.7 ft deep (BS not BD): converted to 52cm deep. Labeled as II-44 on original bag.
310		1	1	20.4	Long bone shank fragment; 1.95ft deep (BS not BD): converted to 59cm deep. Labeled as II-37 on original bag.
323		1	1	16	Immature; FS No. 56
330		1	7	16	Shaft and distal not totally fused; FS No. 56
TOTAL			**474**	**1276.5**	

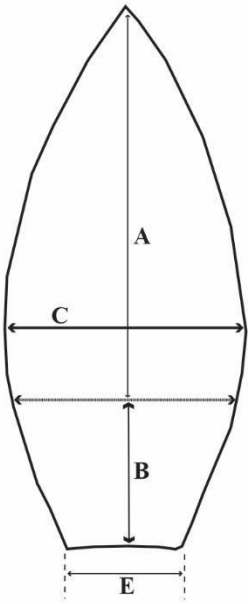
APPENDIX 8

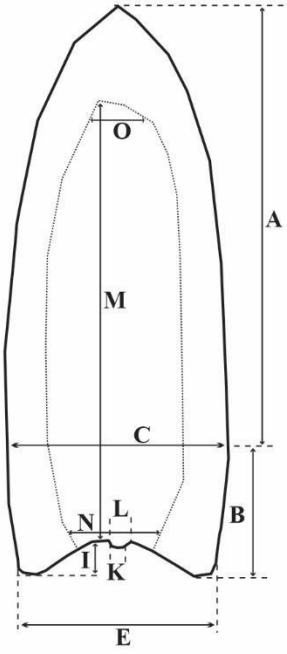
Projectile Point Measurement Diagrams

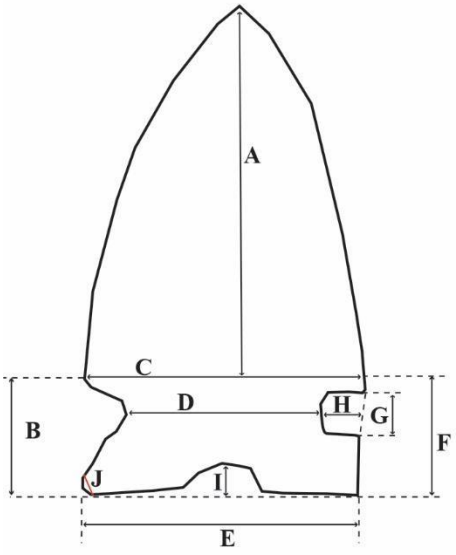
Key to projectile point measurements

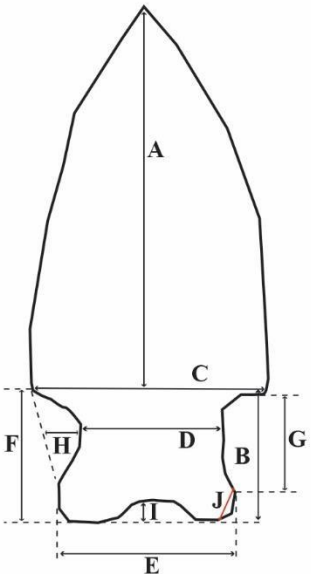
A- body length
B- base height
A+B- total length
C- shoulder width
D- neck width
E- base width
F- shoulder height
G- notch width
H- notch depth
I- depth of basal notch/indentation
J- basal edge height
K- channel flake platform width
L- channel flake point of release
M- flute length
N- flute width (proximal end)
O- flute width (distal end)











APPENDIX 9

Knapping Features Summary Data

Knapping Features 1 through 6 Descriptions

Feature #	Excavation Unit(s)	Excavation Depth	Archaeological Culture Affiliation	Feature Description
1	C-5	180-200cm BS	Folsom	Nearly complete knapping feature (Knapping Feature 1) of the chert MANA unit BCCS41. Core fragments (#16a-16c) and primary through secondary (tertiary pieces minimally represented) Size-Grade 1-5 debitage recovered *in situ*. A notched flake (#15) is also associated. Progressively smaller (1 inch -window screen) used in water screening the bulk sediment.
2	6S/2W, 6S/4W, 8S/2W, and 8S/4W	170-200cm BS	Folsom	Incomplete knapping feature (Knapping Feature 2) of the chert MANA unit BCCS41. Primary through tertiary pieces represented. Size-Grade 14 debitage recovered *in situ*. Biface #19 is associated. Uncertain of smallest mesh used in screening sediments.
3	14S/2E	110-120cm BS	Cody	Incomplete knapping feature (Knapping Feature 3) of the chert MANA unit GBCCS18. Primary through tertiary pieces represented, but tertiary pieces are minimal. Size-Grade 1-4 debitage recovered *in situ*. Sediments dry screened through ¼ inch mesh.
4	6S/6W and 8S/6W	140-160cm BS	Folsom	Moderately complete knapping feature (Knapping Feature 4) of the chert MANA unit BCCS41. Primary through tertiary pieces represented. Size-Grade 1-4 debitage recovered *in situ*. Biface #148 associated. Sediments dry screened through 1/4 and 1/8 inch mesh.
5	N1/W3 and N2/W4	75-90cm BS	Cody	Incomplete knapping feature (Knapping Feature 5) of the chert MANA unit GBCCS18. Primary through tertiary pieces represented, but tertiary pieces are minimal. Size-Grade 1-3 debitage recovered *in situ*. Sediments dry screened through presumably ¼ inch mesh.
6	S1/W3, S1/W4, S1/W5, and S2/W3	60-75cm BS	Cody	Largely complete knapping feature (Knapping Feature 6) of the chert MANA unit CCCS6. Primary through tertiary pieces represented, but tertiary pieces dominate. Size-Grade 1-4 debitage recovered *in situ*. Some of the debitage came from unestablished unit S2/W3 and combined by Forbis (presumably) with the S1/W3 debitage. Sediments dry screened through presumably ¼ inch mesh.

Knapping Features 1 through 6 Summary

Site #	Feature #	Lithic / MANA Code	Excavation Unit(s)	Excavation Depth	CMU	Possible Associated Artifacts	Associated Artifact Excavation Unit(s)	Associated Artifact Excavation Depth	Archaeological Culture Affiliation
24JF4	1	BCCS41	C-5	180-200 cm BS	3	core #16	C-5	180-200cm	Folsom
24JF4	1	BCCS41	C-5	180-200 cm BS	3	core #46	2000-C	160-180cm	Folsom
24JF4	1	BCCS41	C-5	180-200 cm BS	3	core #15	C-7	160-180cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	core #72	98-South Block	190-200cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	core #79	N2/W3	139cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	core #80	S1/W6	107-123cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	core #81	N1/W4	119cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	core #82	S1/W5	119cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	biface #18	8S/2W	160-170cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	biface #19	8S/2W	180-190cm	Folsom
24JF4	1	BCCS41	C-5	180-200cm BS	3	biface #148	8S/6W	140-150cm	Folsom
24JF4	2	BCCS41	6S/2W, 6S/4W, 8S/2W, and 8S/4W	170-200cm BS	8	See above for Knapping Feature 1	See above for Knapping Feature 1		Folsom
24JF4	3	GBCCS18	14S/2E	110-120cm BS	8	See below for Knapping Feature 5 and Feature 6	See below for Knapping Feature 5 and Feature 6		Cody
24JF4	4	BCCS41	6S/2W, 6S/4W, 8S/2W, and 8S/6W	140-160cm BS	2	See above for Knapping Feature 1 and Feature 2	See above for Knapping Feature 1 and Feature 2		Folsom
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #68	N1/W5	79cm	Cody
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #75	N1/W5	73cm	Cody
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #79	S1/W4	67cm	Cody
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #80	S1/W3	79cm	Cody
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #87	S1/W5	70cm	Cody
24JF4	5	GBCCS18	N1/W3 and N2/W4	75-90cm BS	11	biface #145	S2/W3	60-75cm	Cody
24JF4	6	CCCS6	S1/W3, S1/W4, S1/W5 and S2/W3	60-75cm BS	11	core #47	20008-SBE	100-120cm	Cody

APPENDIX 10

EDXRF Analysis of Selected Dacite and Obsidian Pieces

Geochemical Research Laboratory Letter Report 2018-46

Energy Dispersive X-ray Fluorescence Analysis of Obsidian and Dacite Artifacts from the MacHaffie Site (24JF4), Southwestern, Montana

September 1, 2020

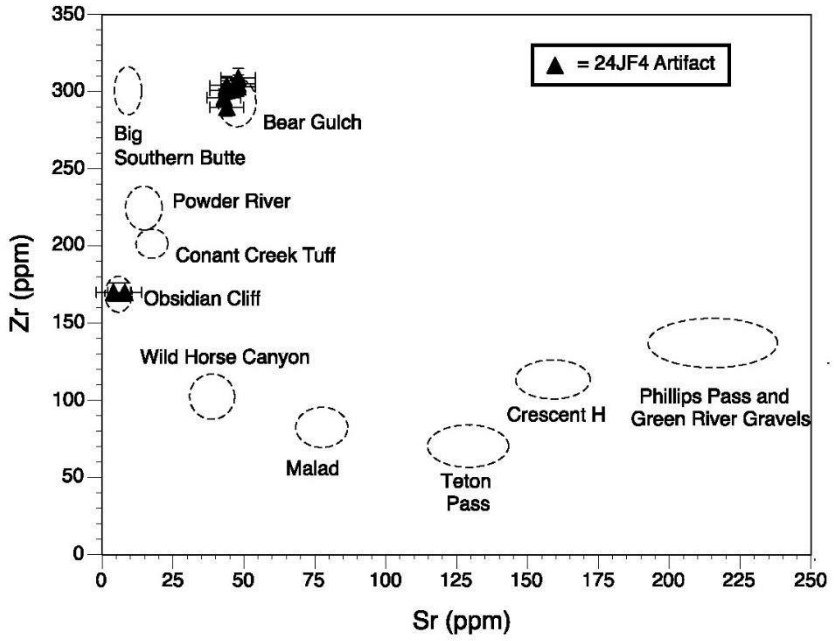
Mr. Patrick J. Rennie
DNRC Archaeologist
Department of Natural Resources and Conservation
P.O. Box 201601
Helena, MT 59620-1601

Dear Patrick:

This letter contains tables and figures presenting energy dispersive x-ray fluorescence (edxrf) data generated from the analysis of 46 artifacts (15 obsidian and 31 dacite) from the MacHaffie Site (24JF4), southwestern Montana. The edxrf research reported herein was completed pursuant to your letter requests of June 11 and November 5, 2018. The edxrf spectrometer, laboratory analysis conditions, and comparative literature references employed for the present analysis are the same as I reported for samples from Grady Ranch (Rennie et al. 2008) and dacite from Willow Creek (Hughes 2014).

Figure 1

Zr vs. Sr Composition of Large Obsidian Artifacts from 24JF4



Dashed lines represent range of variation measured in archaeologically significant geological obsidian source samples from the Rocky Mountains area. Symbols plot specimens from Table 1.

Table 2

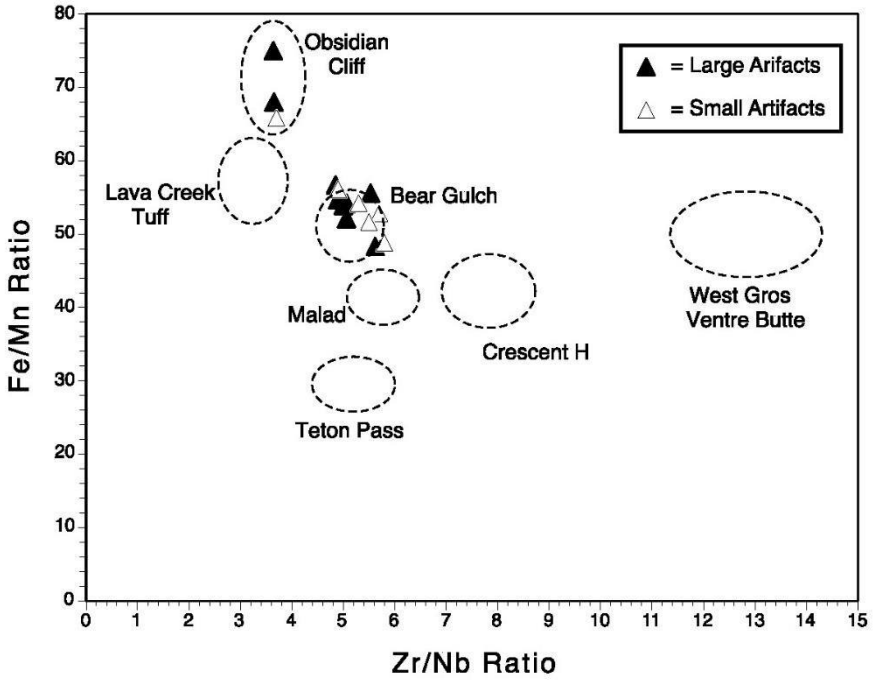
Integrated Net Count Rate Data for Small/Thin Obsidian Artifacts from 24JF4, Montana

	Element Intensities							Intensity Ratios						
Artifact no.	Rb	Sr	Zr	Σ Rb,Sr,Zr	Rb%	Sr%	Zr%	Fe/Mn	Rb/Sr	Zr/Y	Y/Nb	Zr/Nb	Sr/Y	Obsidian Source (Chemical Type)
122 (O-6)	370	10	396	776	.477	.013	.510	65.7	37.0	2.6	1.4	3.7	.1	Obsidian Cliff
2667 (O-5)	397	110	1084	1591	.250	.069	.681	54.2	3.6	7.9	.7	5.3	.8	Bear Gulch
2668 (O-4)	347	105	1017	1469	.236	.072	.692	52.9	3.3	8.5	.6	5.2	.9	Bear Gulch
2820 (O-8)	387	108	1063	1558	.248	.069	.682	53.4	3.6	8.1	.6	4.9	.9	Bear Gulch
3196 (O-2)	424	122	1104	1650	.257	.074	.669	51.6	3.5	8.5	.7	5.5	.9	Bear Gulch
8147 (O-3)	274	79	746	1099	.249	.072	.679	53.8	3.5	7.9	.8	6.0	.8	Bear Gulch

Elemental intensities (peak counts/second above background) generated at 40 seconds livetime.

Figure 2

Fe/Mn vs. Zr/Nb Ratio Plots for Small/Thin Obsidian Artifacts from 24JF4, Montana



Dashed lines represent range of variation measured in archaeologically significant geological obsidian source samples from the Rocky Mountains area. Data from Table 2.

Table 3

Integrated Net Count Rate Data for Small/Thin Obsidian Dacite from 24JT4, Montana

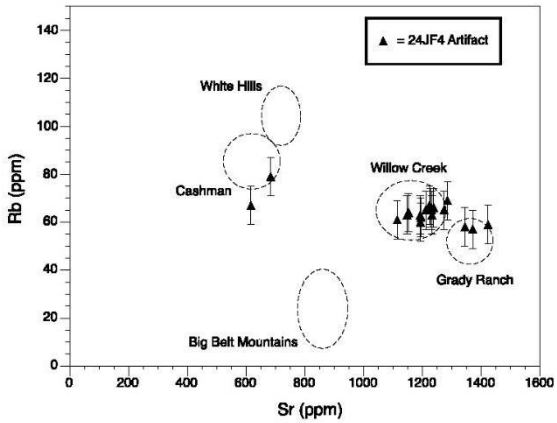
	Element Intensities								Intensity Ratios					
Artifact no.	Rb	Sr	Zr	Σ Rb,Sr,Zr	Rb%	Sr%	Zr%	Fe/Mn	Rb/Sr	Zr/Y	Y/Nb	Zr/Nb	Sr/Y	Obsidian Source (Chemical Type)
144 (D-10)	109	2532	622	3263	.033	.776	.191	92.0	<.1	20.1	.8	15.6	81.7	?
255 (D-20)	274	1585	936	2795	.098	.567	.335	40.8	.2	11.3	1.3	14.6	19.1	?
292 (D-1)	122	3214	633	3969	.031	.810	.160	89.0	<.1	19.8	.7	13.5	100.1	?
1173 (D-13)	50	1071	250	1371	.037	.781	.182	62.7	<.1	20.8	.7	13.9	89.3	?
1215 (D-12)	5	72	10	87	.058	.828	.115	3.0	.1	1.0	nc	nc	5.5	Non-volcanic
1440 (D-18)	0	1384	52	1436	.000	.964	.036	291.1	--	4.3	2.0	8.7	115.3	Non-volcanic
6122 (D-17)	109	2494	607	3210	.034	.777	.189	88.8	<.1	18.4	1.0	19.0	75.6	?
6542 (D-21)	115	2606	629	3350	.034	.778	.188	91.9	<.1	18.0	1.0	17.0	74.5	?
8073 (D-3a)	124	2680	639	3443	.036	.778	.186	83.6	<.1	18.8	.8	15.6	78.8	?
8074 (D-3b)	128	2560	563	3251	.039	.788	.173	85.1	<.1	17.6	1.0	18.2	80.0	?
8156 (D-11)	107	2395	602	3104	.035	.772	.194	73.1	<.1	24.1	.7	15.8	95.8	?

Elemental intensities (peak counts/second above background) generated at 40 seconds livetime. nc= not computed.

Edxrf data in Table 1 and Table 2, and Figures 1 and 2, show that— in total—12 of 15 obsidian artifacts analyzed from 24JF4 were manufactured from Bear Gulch obsidian, and that the other three specimens were made from Obsidian Cliff volcanic glass.

Figure 3

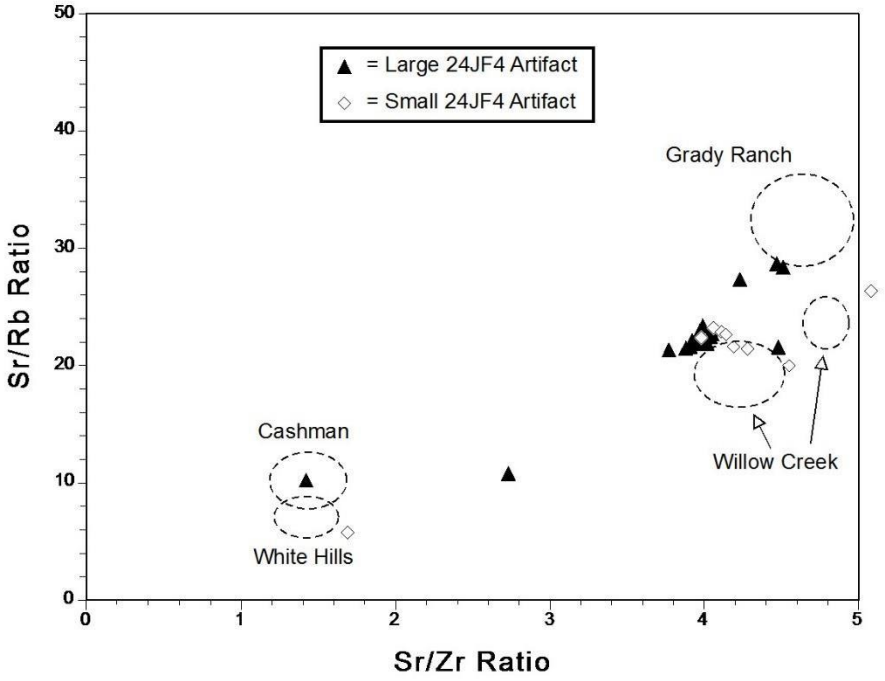
Rb vs. Sr Composition of Non-Obsidian Artifacts from 24JF4, Montana



Dashed lines represent range of variation measured in archaeologically significant non-obsidian geological source samples from the Rocky Mountains area. Filled triangle plots data for the specimens in Table 1. Error bars are two-sigma (95% confidence interval) estimates for each artifact (from Table 1). Cashman data plotted from Baumler et al. (2001: Table 2), Grady Ranch data from Rennie et al. (2008: Table 2), Willow Creek from Hughes (2014), Big Belt Mountains from Hughes (unpublished data), White Hills from Rennie et al. (2020).

Figure 4

Sr/Rb vs. Sr/Zr Integrated Net Intensity Element Data for Artifacts from 24JF4, Montana



Dashed lines represent range of variation measured in archaeologically significant geological dacite source samples from the Rocky Mountains area. Symbols plot the samples normalized from integrated net peak intensity data used to compute quantitative values in Table 2 and in Hughes (2014: Table 1).

Thirty-one artifacts—probably dacite— also were analyzed. Other than the four specimens attributable to dacite of the Cashman chemical type, Figure 3 and Table 1 show that most specimens are similar in Rb/Sr composition to dacite identified recently at the Willow Creek quarry (Hughes 2014). But, as noted in the latter report and as I emphasized in a subsequent study (Hughes 2017), there are some important trace element differences between the geological samples from Willow Creek. Figure 1 in Hughes (2014) shows that there are slight Rb/Sr composition differences evident in source standards, which are mirrored in the right (1200-1300 ppm) cluster of artifact plots in the present study (see Figure 3 above). In the present case, Zr composition values for artifacts are 40-50 ppm greater than measured in Willow Creek samples and the total iron composition of these artifacts also is significantly greater than Willow Creek standards.

The re-plotted values for geological standards in my 2014 study were normalized to allow comparisons between samples of different physical size (as discussed in Hughes 2010). This plot (Figure 4) shows the influence of Zr in previously measured Willow Creek samples (see Hughes 2104: 2). Despite this parsing of existing geological samples of Willow Creek dacite, Figure 4 herein shows a tenuous and unsatisfactory linkage with artifacts analyzed in the present study—very much like the results from 24CA1766 (Hughes 2017: Figure 3). The Rb/Sr data in Figure 3 certainly overlap with Willow Creek standards, but when Zr values are added (Figure 4) the artifact-to-source attributions are much less convincing. Figure 3 shows that the bulk of the specimens that might have been attributed

to Willow Creek on the basis of Rb/Sr data (Figure 2) plot in a rather tight cluster- but with values that are mostly greater Willow Creek quarry specimens reported in Hughes (2014).

These dacite results are consistent with my conclusion in an earlier study (Hughes 2017) — that chemical data suggest that there may be an additional geological unit, or units, in the vicinity which contains artifact-quality material with somewhat greater amounts of Zr and total iron than sampled so far at Willow Creek. Alternatively, such chemical preconditions might be met at a proximate yet-to-be-sampled eruptive area, which might expand and extend the known range of dacite erupted from the unit.

Please contact me at my laboratory (phone: [650] 851-1410; e-mail: rehughes@silcon.com; lab web site: www.geochemicalresearch.com) if I can provide any further assistance or information.

Sincerely,

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

REFERENCES

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Rennie, Patrick, Mark F. Baumler, Cora G. Helm, Richard E. Hughes, M. Damon Murdo, Steve Platt, and Stan Wilmoth
2008 Grady Ranch (24CL2013): A Newly Characterized Dacite Procurement Locality in West-Central Montana. **Archaeology in Montana** 49 (1): 1-13.

Table 1

Quantitative Composition Estimates for Large Obsidian and Dacite Artifacts from 24JF4, Montana

Cat. /XRF Number	Trace and Selected Minor Element Concentrations											Ratio	Source (Chemical Type)
	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	
5	nm	nm	270	8	84	170	50	32	nm	nm	nm	68	Obsidian Cliff
(O-11)			±5	±2	±3	±4	±3	±18					
25	nm	nm	182	48	47	309	54	632	nm	nm	nm	49	Bear Gulch
(O-10)			±4	±3	≠3	±5	±3	±26					
1214	nm	nm	169	43	47	296	57	662	nm	nm	nm	54	Bear Gulch
(O-7)			±4	±3	±3	±5	±3	±23					
1723	nm	nm	178	44	45	304	61	728	nm	nm	nm	56	Bear Gulch
(O-15)			±4	±3	±3	±5	±3	±23					
2821	nm	nm	187	48	47	303	59	646	nm	nm	nm	52	Bear Gulch
(O-9)			±4	±3	±3	±5	±3	±28					
3195	nm	nm	272	4	85	170	48	nm	nm	nm	nm	75	Obsidian Cliff
(O-1)			±5	±2	±3	±4	±3						
3743	nm	nm	180	48	47	305	52	656	nm	nm	nm	55	Bear Gulch
(O-12)			±4	±3	±3	±5	±3	±22					
6005	nm	nm	174	44	42	290	52	736	nm	nm	nm	56	Bear Gulch
(O-14)			±4	±3	±3	±5	±3	±24					
8705	nm	nm	177	44	45	301	59	734	nm	nm	nm	54	Bear Gulch
(O-13)			±4	±3	±3	±5	±3	±24					
8	nm	nm	60	1194	12	195	10	2658	nm	nm	4.41	87	?
(D-23)			±3	±16	±2	±5	±2	±32			±.06		
11	nm	nm	65	1273	15	205	13	2708	nm	nm	4.86	96	?
(D-24)			±3	±16	±2	±5	±2	±32			±.06		
1203	nm	nm	64	1153	14	200	9	2684	nm	nm	4.26	97	?
(D-25)			±3	±15	±2	±4	±2	±34			±.05		
1287	nm	nm	3	3	1	2	1	81	nm	nm	nm	27	Non-volcanic
(D-4)			±2	±2	±2	±2	±2	±19					
1353	nm	nm	66	1239	13	204	14	2703	nm	nm	4.72	81	?
(D-9)			±3	±16	±2	±5	±2	±31			±.06		
1700	nm	nm	61	1115	8	162	12	3623	nm	nm	3.78	98	?
(D-26)			±3	±15	±2	±4	±2	±32			±.05		
1708	nm	nm	79	684	16	315	13	2195	nm	nm	3.95	56	Cashman
(D-29)			±3	±6	±2	±5	±2	±29			±.05		

Values in parts per million (ppm) except total iron (expressed in weight percent) and Fe/Mn ratios; ± = 2σ estimate (in ppm) of x-ray counting uncertainty and regression fitting error at 120-240 seconds livetime; nm = not measured.

Table 1

Quantitative Composition Estimates for Large Obsidian and Dacite Artifacts from 24JF4, Montana

Cat. /XRF Number	Trace and Selected Minor Element Concentrations											Ratio	Source
	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	(Chemical Type)
1710	nm	nm	62	1195	10	193	14	2830	nm	nm	4.37	85	?
(D-28)			±3	±15	±2	±4	±2	±33			±.05		
1711	nm	nm	63	1233	15	203	11	2524	nm	nm	4.83	87	?
(D-30)			±3	±15	±2	±5	±2	±30			±.05		
2334	nm	nm	59	1424	12	206	13	2985	nm	nm	5.15	97	?
(D-14)			±3	±18	±2	±5	±2	±34			±.06		
2685	nm	nm	57	1372	12	201	15	2874	nm	nm	4.74	86	?
(D-8)			±3	±17	±2	±5	±2	±32			±.06		
2686	nm	nm	69	1286	14	211	11	2641	nm	nm	5.04	86	?
(D-7)			±3	±16	±2	±5	±2	±40			±.06		
3347	nm	nm	63	1193	10	193	12	2720	nm	nm	4.31	94	?
(D-5)			±3	±15	±2	±5	±2	±33			±.06		
3725	nm	nm	65	1212	12	202	12	2916	nm	nm	4.63	92	?
(D-27)			±3	±15	±2	±5	±2	±34			±.06		
3807	nm	nm	65	1232	13	202	12	2837	nm	nm	4.51	96	?
(D-16)			±3	±16	±2	±5	±2	±32			±.06		
3958	nm	nm	63	1148	12	192	14	2515	nm	nm	4.30	87	?
(D-2)			±3	±14	±2	±5	±2	±31			±.06		
5850	nm	nm	67	617	23	148	11	1416	nm	nm	9.10	63	?
(D-6)			±3	±6	±2	±4	±2	±32			±.07		
6587	nm	nm	58	1345	14	208	13	2960	nm	nm	4.84	94	?
(D-22)			±3	±17	±2	±5	±2	±33			±.06		
7995	nm	nm	67	1225	13	206	13	2666	nm	nm	4.57	89	?
(D-15)			±3	±16	±2	±5	±2	±35			±.06		
8214	nm	nm	66	1228	11	200	12	2542	nm	nm	4.84	85	?
(D-19)			±3	±16	±2	±5	±2	±35			±.06		
U.S. Geological Survey Reference Standard													
RGM-1	nm	nm	148	109	26	221	10	804	nm	nm	1.86	66	Glass Mtn., CA
(measured)			±4	±3	±3	±4	±3	±23			±.02		
RGM-1	nm	nm	149	108	25	219	9	807	1600	279	1.86	nr	Glass Mtn., CA
(recommended)													

Values in parts per million (ppm) except total iron (expressed in weight percent) and Fe/Mn ratios; ± = 2σ estimate (in ppm) of x-ray counting uncertainty and regression fitting error at 120-240 seconds livetime; nm = not measured.

24JF4 (MacHaffie Site): Obsidian artifacts submitted for EDXRF analysis

Artifact Class	Catalogue #	XRF Sample #	Excavation Unit	Excavation Depth	Component	Source (see Hughs 2020)
debitage	3195	O-1	98-South Block	0-10cm BS	Helena	Obsidian Cliff
debitage	3196	O-2	98-South Block	0-10cm BS	Helena	Bear Gulch
debitage	8147	O-3	2S/0E	10-20cm BS	Helena	Bear Gulch
debitage	2668	O-4	2000-C	0-20cm BS	Helena	Bear Gulch
debitage	2667	O-5	2000-C	0-20cm BS	Helena	Bear Gulch
debitage	122	O-6	6S/6W	20-30cm BS	Helena	Obsidian Cliff
debitage	1214	O-7	2000-5	20-40cm BS	Helena	Bear Gulch
debitage	2820	O-8	2000-C	20-40cm BS	Helena	Bear Gulch
debitage	2821	O-9	2000-C	20-40cm BS	Helena	Bear Gulch
biface	25	O-10	14S/2E	20-30cm BS	Helena	Bear Gulch
projectile point: Pelican Lake?	5	O-11	4S/0E	30-40cm BS	Helena	Obsidian Cliff
DEF/M	33	O-12	S1/E1	0-5cm BS	Helena	Bear Gulch
debitage	8705	O-13	S2/W2	67-82cm BS	Cody	Bear Gulch
biface	100	O-14	S2/W2	67-82cm BS	Cody	Bear Gulch
projectile point: McKean	44	O-15	S1/W4	8-12cm BS	Helena	Bear Gulch

24JF4 (MacHaffie Site): Dacite artifacts submitted for EDXRF analysis

Artifact Class	Catalogue #	XRF Sample #	Excavation Unit	Excavation Depth	Component	Comments (see Hughs 2020)
debitage	292	D-1	6S/6W	0-10cm BS	Helena	source unknown
debitage	3958	D-2	98-West Test	0-10cm BS	Helena	source unknown
debitage	8073	D-3a	2S/0E	0-10cm BS	Helena	source unknown
debitage	8074	D-3b	2S/0E	0-10cm BS	Helena	non-volcanic (hornfels?)
debitage	1287	D-4	2000-5	0-20cm BS	Helena	source unknown
debitage	3347	D-5	98-South Block	10-20cm BS	Helena	source unknown
debitage	5850	D-6	8S/4W	10-20cm BS	Helena	source unknown
debitage	2686	D-7	2000-C	0-20cm BS	Helena	source unknown
debitage	2685	D-8	2000-C	0-20cm BS	Helena	source unknown
debitage	1353	D-9	2000-5	0-20cm BS	Helena	source unknown
debitage	144	D-10	6S/6W	20-30cm BS	Helena	source unknown
debitage	8156	D-11	2S/0E	20-30cm BS	Helena	source unknown
debitage	1215	D-12	2000-5	20-40cm BS	Helena	non-volcanic (hornfels?)
debitage	1173	D-13	2000-5	20-40cm BS	Helena	source unknown
debitage	2334	D-14	2000-B	40-60cm BS	Helena	source unknown
debitage	7995	D-15	4S/0E	50-60cm BS	Helena	source unknown
debitage	3807	D-16	98-South Block	60-70cm BS	Helena	source unknown
debitage	6122	D-17	8S/4W	60-70cm BS	Helena	source unknown
debitage	1440	D-18	2000-4	60-80cm BS	Helena	non-volcanic (hornfels?)
debitage	8214	D-19	2S/0E	70-80cm BS	Helena	source unknown
debitage	255	D-20	6S/6W	70-80cm BS	Helena	source unknown
debitage	6542	D-21	6S/4W	80-90cm BS	Helena	source unknown
debitage	6587	D-22	6S/4W	120-130cm BS	Cody	source unknown
biface	8	D-23	2000-B	60-80cm BS	Helena	source unknown
DEF/M	11	D-24	98-West Trench	40-50cm BS	Helena	source unknown
projectile point: Eden	22	D-25	S1/W2	79cm BS	Cody	source unknown

Appendix 11

MacHaffie Site Collection:
Container Contents under University of Montana Accession # 2010.09.33

Containers and Container Contents for MacHaffie (24JF4) University of Montana Accession # 2010.09.33

Container Designation	Principal Investigator	Container Contents	Container Type
A	Forbis, Davis and Rennie	Electronic and photocopies of Richard G. Forbis' field notes, photo logs, photographs, selected "Fonds" material (University of Calgary). 1985 photos of MAS field trip to MacHaffie site (April 28th, 1985 (Michael C. Wilson photographs). 1989 through 2018 level records, field notes, excavation maps, correspondence, photographs/slides, specialized studies, data tables, artifact catalogues, catalogue cards, 2021 technical report, tables & illustrations (hard copies and electronic files).	clear plastic bin: 16" x 22" x 11"
B	Davis	All dacite and obsidian debitage (1989 through 2018). All debitage of interest (1989 through 2018). Chipped stone debitage recovered during the 1989-2010 field seasons: Materials collected from excavation units 0N/0E, 2N/0E, 4N/0E, 4S/0E, 2S/0E, 96-West Test, 98-South Block, Unit 1.	clear plastic bin: 16" x 22" x 11"
C	Davis and Rennie	Chipped stone debitage recovered during the 1989 through 2018 field seasons: Materials collected from excavation units 4N/8E, 6N/8E, TU-1, C1-C9, 2000-A, 2000-B, 2000C, 2000-4, 2000-5, 20008 SBE. Includes Knapping Feature 1.	clear plastic bin: 16" x 22" x 11"
D	Davis and Rennie	Chipped stone debitage recovered during the 1989 - 2018 field seasons. Materials collected from excavation units 6S/2W, 6S/4W, 6S/6W, 8S/2W, 8S/4W, 8S/6W, 14S/2E, and 16S/2E. Includes Knapping Feature 2, Feature 3and Feature 4.	clear plastic bin: 16" x 22" x 11"
E	Davis and Rennie	Chipped Stone Tools, Cores, FCR, Abraded/Ground Stone Artifacts, and Miscellaneous Lithic Pieces recovered during 1989 - 2018 field seasons. Includes historic artifacts retained from 1989 - 2018 field seasons.	clear plastic bin: 16" x 22" x 11"

Containers and Container Contents for MacHaffie (24JF4) University of Montana Accession # 2010.09.33 (con't)

Container Designation	Principal Investigator	Container Contents	Container Type
F	Bliss, Byrd, Forbis, and Hughes	Chipped Stone Tools, Cores, FCR, Abraded/Ground Stone Artifacts, and Miscellaneous Lithic Pieces from 1947(?) - 1951 field seasons. All obsidian and dacite debitage (1951). Includes a few poor artifact casts. John Byrd's MacHaffie artifact collection from 1952 (eight pieces)	clear plastic bin: 16" x 22" x 11"
G	Forbis	Chipped stone debitage recovered during the 1951 field season. Materials collected from excavation units N1/W3, N1/W6, N2/W1, N2/W2, N2/W4, N2/W5, N2/W6, N3/W4, S1/E2, and S1/E3. Includes Knapping Feature 5.	clear plastic bin: 16" x 22" x 11"
H	Forbis	Chipped stone debitage recovered during the 1951 field season. Materials collected from excavation units N1/W1, N1/W2, N1/W4, N1/W5, N2/W3, S1/W1, S1/W2, S1/W3, S1/W4, and S1/W5. Includes Knapping Feature 6.	clear plastic bin: 16" x 22" x 11"
I	Forbis, Davis and Rennie	Soil samples and faunal remains from the 1951 and 1989 - 2018 field seasons.	clear plastic bin: 16" x 22" x 11"

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