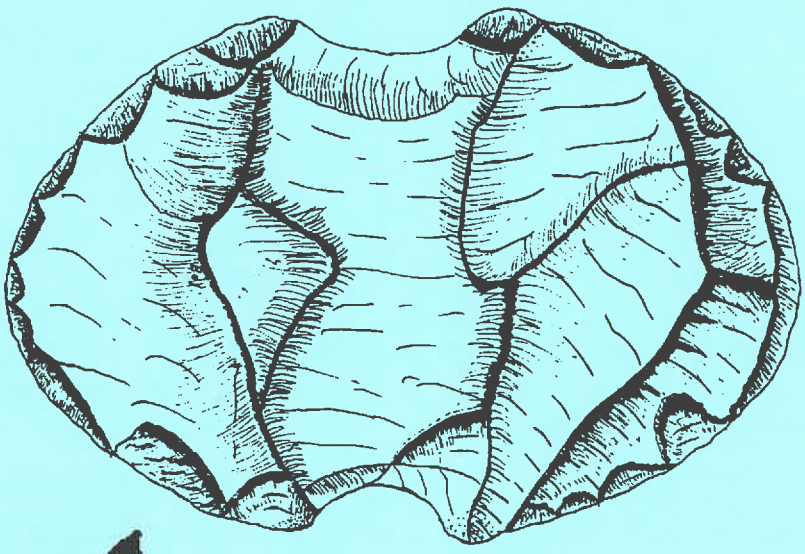
THE WYOMING ARCHAEOLOGIST



VOLUME 40(1)

SPRING 1996

THE WYOMING ARCHAEOLOGIST
Wyoming Archaeological Society, Inc.

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THE WYOMING ARCHAEOLOGIST is published quarterly by the Wyoming State Archaeological Society, with the financial assistance of the Wyoming Department of Commerce. Address manuscripts and news items for publication to: Bonnie Johnson, Editor, *The Wyoming Archaeologist*, 1301 Harney, #4, Laramie, Wyoming 82070.

Please send a minimum of two (2) hard copies of each manuscript submitted. A third copy would speed the review process. Please contact the Associate Editor for instructions if the manuscript is available on computer disk. Readers should consult the articles in this issue for style and format. Deadline for submission of copy for spring issues is January 1 and for fall issues July 1. Reports and articles received by the Associate Editor after those dates will be held for the following issue.

Membership period is from January through December. All subscriptions expire with the Fall/Winter Issue and renewals are due the first part of January each year. Continuing members whose dues are not paid by March 31 of the new year will receive back issues only upon payment of $5.00 per issue. If you move or have a change of address, please notify the Executive Secretary/Treasurer. Your *WYOMING ARCHAEOLOGIST* will not be forwarded unless payment is received for return and forwarding postage.

Back issues in print can be purchased for $5.00 each plus postage. Back issues out of print are available at $0.15 per page plus postage.

Checks for chapter subscriptions and renewals should be sent to the chapter secretary involved. All other checks, subscriptions, and renewals should be addressed to the Executive Secretary/Treasurer. Correspondence and orders for back issues should be addressed to the Executive Secretary/Treasurer.

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Society yearly subscription rates are as follows:

Individual Associate Member @ $10.00
Institutional Member @ $15.00
Canada and Foreign @ $19.00

Other Memberships, including Supporting and Contributing are available. Contact the Executive Secretary/Treasurer for information. Local chapter dues are in addition to state society dues. The Wyoming Archaeological Society is a Non-Profit Organization.

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ISSN: 0043-9665

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Wyoming Archaeological Foundation
George C. Frison, President (1966)
Robin Perdue, Secretary/Treasurer (1999)
Dewey Baars, WAS Past President (1997)
Russ Tanner, Member (1997)
Dudley Gardner, Member (1998)
Julie Francis, Member (1999)
Mary Lou Larson, ex officio Member
Mark E. Miller, ex officio Member

THE WYOMING ARCHAEOLOGIST

VOLUME 40(1), SPRING 1996

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WYOMING ARCHAEOLOGICAL SOCIETY, INC.
1996 ANNUAL MEETING MINUTES
9:03 a.m. - Western Wyoming College - Rock Springs, WY; Saturday, April 27, 1996

PRESIDING: Robin Perdue, President
CALL TO ORDER: 9:03 a.m.
ROLL CALL AND CERTIFICATION OF DELEGATES: Secretary/Treasurer Carolyn Buff certified the voting delegates: Absaroka, Russell Perdue; Ancient Trails, absent; Casper, Julie Francis and Carolyn Buff; Cherokee Trail, Rod Laird; Cheyenne, Susan Adams and Susan Carlson; Fremont, Loucille Adams and Gail Gossett; High Plains, Alan and Terry Korell; Platte, absent; Rawlins, absent; Sheridan/Buffalo County, absent; and Sweetwater, Dirk Mummy and Joe Bozovich.

Roll call showed seven chapters represented: Absaroka, Casper, Cheyenne, Cherokee Trail, Fremont, High Plains, and Sweetwater. Not represented at the meeting was Ancient Trails, Rawlins, Platte County, and Sheridan/Buffalo.

MINUTES OF LAST ANNUAL MEETING: April 22, 1995: Motion by Joe Bozovich, second by Julie Francis to approve the minutes as printed in the Fall 1995 issue of The Wyoming Archaeologist. Carried.

TREASURER'S REPORT: Secretary/Treasurer Carolyn Buff gave the treasurer's report showing a total net worth as of March 31, 1996 of $26,841.11, an increase of $1,521.74. Motion by Alan Korell, second by Terry Korell to file the treasurer's report for audit. Carried.

AUDITOR'S REPORT: Mary Lou Larson, Julie Francis, and Mary Hopkins reported that they had examined the accounts and receipts of the Secretary/Treasurer, and found them in order.

EDITOR'S REPORT: Danny Walker for Bonnie Johnson, editor, reported that the spring issue is in the works.

LIBRARIAN'S REPORT: Danny Walker reported that the nine exchange publications are on file at the Department of Anthropology, University of Wyoming.

SCHOLARSHIP COMMITTEE: Carolyn Buff announced that the committee would meet during lunch at the Outlaw Inn.

CHAPTER REPORTS: Were given by all chapters present.

STATE ARCHAEOLOGIST'S REPORT: Mark Miller thanked the Society and members for all the help with the Plains Conference held in Laramie in October. It was the largest conference in the history of the organization. He reported that the legislature had been quiet this year.

- He stated that WAS has contributed over $13,100 to scholarships over the past 27 years (since 1969); 43 students (39 different) have benefitted. Most have gone on to finish graduate work and at least five have completed their PhD's, and several are still working on them.

- His office is working with several agencies to improve the long-term collections management on the UW campus.

- Several points and suggestions were made as the result of the WAPA meeting held on April 26: A committee made up of Julie Francis, Carolyn Buff, Mark Miller, and Rich Adams was appointed to work with the Society and Danny Walker to come up with ways both organizations might help to enhance the journal, help with finances, occasional papers, and trying to put a list of current research in the Archaeologist; the final suggestion put forth was to hold a fall meeting in Dubois to bring in a speaker to discuss some innovative mapping techniques relevant to archaeology and have some field trips, weather permitting. An invitation was extended to WAS to attend this meeting.

Motion by Alan Korell, second by Russell Perdue to approve the publications committee and direct the committee to proceed. Carried.

Motion by Loucille Adams, second by Dirk Murcray to have a joint fall meeting in Dubois. Carried. This meeting will replace the fall workshop in Laramie for this year.

HELL GAP REPORT: George Frison - Asked that the group reflect for a moment on the loss of Grover Phelan and Gary Fry.

- Larry Todd, Mary Lou Larson and Marcel Kornfeld have been hired at the University of Wyoming. Frison recommended that members

write to UW and the Dean of Arts and Sciences complimenting them on these appointments.

- Commended the WAS scholarship program.

- A $100,001 grant has been received from the National Endowment for the Humanities to evaluate, re- evaluate, analyze and publish the Hell Gap data from Harvard. Part of the grant was a gift, the remainder must be matched. The original site records were at Washington State University and faunal materials were in Wisconsin. That material has since been examined. Careful adjudication of data base resources is currently in progress. $20,000 has been obtained from National Geographic and NEH will match the grant. Other funds are being sought from the Wenner-Gren and Leakey Foundations. The site must be properly investigated and researched. Vance Haynes is donating his time and a portion of his AMS budget to further investigations at Hell Gap. The date for the Goshen level has been given at 10,955 years, the Agate Basin level at 1 0,255 ~ 60 years. The only way that justice can be done to reanalysis or analysis is to do some very careful stratigraphic work. Joe Kramer has agreed to donate $10,000 (must be matched) to do the stratigraphic excavation in Locality 1 where there is a complete sequence of the Plains chronology known today. In terms of research, reanalysis of old collections and sites is absolutely vital. Any money that can be raised in the future will be matched by Joseph L. Cramer. The Cramer money will be placed in a special account. Frison will be in touch with the university attorney to set up an account unrelated to the Foundation or to the University. Rob Bonnichsen will be taking out one column looking for human hair. Removal of a column will then provide some stratigraphic information. Massive excavation is not going to be done at the site. Additional work will include opening up the drainage area to prevent flooding and changing the entrance. Visitors are always welcome at the site.

- The Mill Iron Site book is available for $80.00.

- Marcel Kornfeld and the University of Wyoming are beginning plans to establish a research institute. A university committee, as well as an outside committee will be formed to begin the process.

Marcel Kornfeld suggested that Dewey Baars and George Zeimens, as caretakers of the site, put together a newsletter for interested parties to update the progress being made and work that is planned at Hell Gap.

Mary Lou Larson recommended that a Hell Gap benefactor's day be arranged to apprise those people who have donated to the project of the status of the site. Robin Perdue volunteered to publicize any forthcoming activities.

OLD BUSINESS: *Archaeology Support Fund* - We no longer have these monies available. Danny Walker reported that there are still outstanding reports due and because the conditions of the grants were not met, the donor has chosen not to give any further funding for chapter projects. Danny will send a reminder to those chapters who have not completed their reports.

Council of Affiliated Societies/Society for American Archaeology (COAS/SAA) - Representative Marcel Kornfeld reported that he had attended a session on archaeology weeks. He also attended a business meeting where the main focus was a suggestion to put COAS under the public education committee. Mary Hopkins reported that the main function of the public education committee is public school curricula and targets public schools. COAS has more of the philosophy of amateur groups like the WAS. Marcel, Mark Miller and Carolyn Buff will serve on a committee to determine how the Society wants Marcel to vote on any forthcoming issues regarding COAS being merged with the education committee and how coordination will be done. Marcel agreed to continue to serve as the Wyoming representative to COAS.

Membership Committee/Brochure - Carolyn Buff reported the brochures are working for getting new associate members in the Society. The increase is small but steady. Additional brochures are available by contacting Carolyn.

Archaeology Week - There will not be an Archaeology Week this year, but summer events will be publicized throughout the state and press releases will be done. Anyone having events to list should contact Mary Hopkins by May 15.

Chapter Report Forms - Cher Burgess, Mark Miller and Carolyn Buff will rework the forms and try to incorporate the suggested changes and present the final draft to the body at the summer or fall meeting with implementation by the 1997 annual meeting.

NEW BUSINESS: *Wyoming History Day* - Motion

by Russell Perdue, second by Terry Korell that the Wyoming Archaeological Society give a $100 award to the state Wyoming History Day contest. Carried. A committee made up of Danny Walker and Carolyn Buff will determine the criteria for the award and forward it to the appropriate coordinators of the contest.

Honorary Membership - Motion by Rich Adams, second by Julie Francis to accept the nominations of Glenn Sweem and George Brox for honorary membership. Carried.

WYOMING ARCHAEOLOGICAL FOUNDATION: George Frison announced that the Foundation would meet Sunday morning for breakfast. Robin Perdue gave the treasurer's report showing a total net worth of $32,325.88.

ELECTION OF OFFICERS: Gail Gossett, chair, Dean Young and Joe Bozovich, nominated the following officers for 1996-1997: President- Robin Perdue; 1st Vice President - Dirk Murcray; 2nd Vice President - Gail Gossett; Foundation - Julie Francis (3-year term).

Motion by Dewey Baars, second by Dirk Murcray that a unanimous ballot be cast. Carried.

It was announced that the 1st Vice President would be the official WAS representative for Archaeology Week, and that the 2nd Vice President is the chair of the nominating committee.

SITE OF 1996 SUMMER MEETING: Motion by Rich Adams, second by Alan Korell to hold the summer meeting at Hell Gap June 22, 1996. Carried.

SELECTION OF SITE FOR 1997 ANNUAL SPRING MEETING OF THE SOCIETY AND FOUNDATION: Motion by Dewey Baars, second by Rich Adams that the 1997 annual meeting be hosted by the Casper Chapter. Carried.

1997 NOMINATING COMMITTEE: Gail Gossett, chair.

ANNOUNCEMENTS: Carolyn Buff mentioned that she had membership cards and membership brochures available.

Carolyn requested that chapters update their officer list.

A thank-you was read from Lori Phelan for the donation to the American Diabetes Association in Grover Phelan's memory.

Julie Francis announced that there would be field work at Goff Creek and Moss Creek west of Cody and on Highway 24, and issued an invitation for volunteers to participate. Anyone interested can call Julie.

There will be work at Hell Gap through all of June. Anyone interested can call Marcel Kornfeld.

Danny Walker announced that there are volunteer opportunities at Fort Laramie during June. Anyone interested can call Danny.

ADJOURN: 11:05 a.m.

BANQUET: The banquet address was presented by Dr. Tom Dillehay, Professor of Anthropology at the University of Kentucky, who spoke on "The Pleistocene Peopling of South America.

GOLDEN TROWEL AWARD: June Frison.

/s/ Carolyn M. Buff
Carolyn M. Buff
Executive Secretary/Treasurer

/s/ Robin Perdue
Robin Perdue
President

WYOMING ARCHAEOLOGICAL SOCIETY, INC.; SCHOLARSHIP COMMITTEE MINUTES - April 22, 1996

PRESIDING: Carolyn Buff, Chair

PRESENT: Carolyn Buff, George Frison, Gail Gossett, Ray Gossett, Mary Lou Larson, Dirk Murcray, and Robin Perdue.

Four outstanding applications were received. The committee voted to give the Frison Scholarship to Christopher Hall, and the Mulloy Scholarship to Carol-Anne Garrison. Motion by Robin Perdue, second by Dirk Murcray to award both scholarships in the amount of $400.00. Carried.

/s/ Carolyn M. Buff
Carolyn M. Buff
Scholarship Committee Chair

WYOMING ARCHAEOLOGICAL SOCIETY, INC.
Treasurer's Report For Fiscal Year Ending March 31, 1996

				BALANCE
CHECKING ACCOUNT - Key Bank				
Beginning Balance	$ 2,858.44			
Deposits	$ 1,343.50			
Interest Earned	$ 21.62			$ 4,223.56
Close Account		$ 4,223.56		$ -.--
CHECKING ACCOUNT - NCSEFCU				
Open Account	$ 500.00			
Deposits	$ 3,063.91			
Interest Earned	$ 19.32			
TOTAL INCOME		$ 3,583.23		$ 3,583.23
Expenses - Key Bank				
United Center - Trowel		$ 9.49		
Merback Awards - Engraving		$ 16.96		
Wyoming Archaeological Foundation - Dues		$ 277.00		
Char Burgess - Island In the Plains		$ 200.00		
University of WY - Plains Conference		$ 500.00		
Patrice White - Scholarship		$ 350.00		
Judson Finley - Scholarship		$ 350.00		
Cherokee Trail Chapter - Meeting Expenses		$ 86.00		
Saratoga Inn - Hester Room		$ 108.30		
Thomas Hester- Honorarium/Expenses		$ 650.00		
Casper College - Postage		$ 32.00		
Gail Gossett - Grant - Archaeology Week		$ 62.10		
SHPO/DOC - Archaeology Week		$ 446.00		
Kevin Tonkovich - Archaeology Week Grant Evaluation		$ 50.00		
Bank Charges		$ 3.00		
NCSEFCU - open account		$ 500.00		
Service Charge - Checks		$ 20.80		
Bank Charge		$ 2.00		
Close Account		$ 559.91		
TOTAL EXPENSES - KEY BANK			$ 4,223.56	$ -.--
Natrona County School Employees Federal Credit Union				
Natrona Printing - Flyers		$ 48.76		
NCSEFCU - Checks		$ 9.50		
Casper College - Postage		$ 32.00		
SAA - Membership		$ 30.00		
Casper College - Postage		$ 32.00		
Secretary of State - Corp Fees		$ 10.00		
Casper College - Postage		$ 32.00		
Bonnie Johnson - Editor Expenses		$ 50.00		
Builder's Mart - Trowel		$ 8.99		
American Diabetes Assn - Phelan Memorial		$ 50.00		
TOTAL EXPENSES - NCSEFCU			$ 303.25	
TOTAL EXPENSES			$ 4,526.81	
ENDING BALANCE				$ 3,279.98
SAVINGS ACCOUNT - Key Bank				
Beginning Balance	$ 4,207.39			
Interest Earned	$ 21.87			$ 4,229.26
Close Account		$ 4,229.26		$ -.--
NCSEFCU - Open Account				
Deposits	$ 2,615.62			
Interest Earned	$ 53.82			
Ending Balance		$ 2,669.44		$ 2,669.44

CERTIFICATE OF DEPOSIT - Key Bank			
Beginning Balance	$ 18,253.54		
Interest Earned	$ 132.82		$ 18,386.36
Close Account		$ 18,386.36	$ -.--
NCSEFCU - Open Account	$ 20,000.00		
Dividends Earned	$ 891.69		
ENDING BALANCE		$ 20,891.69	$ 20,891.69
TOTAL NET WORTH AS OF MARCH 31, 1998			$ 26,841.11
Total income	$ 6,048.55		
Total Expenses		$ 4,526.81	
Net Increase			$ 1,521.74
SCHOLARSHIP ACCOUNT			
Beginning Balance	$ (2,211.00)		
Deposit - Frison Retirement Donation	$ 100.00		
Deposit - Julie Francis Donation	$ 25.00		
Deposit - Julie Francis Donation	$ 25.00	$ (2,061.00)	
TOTAL			$ (2,061.00)
ARCHAEOLOGY WEEK ACCOUNT			
Balance	$ 1,377.75	$ 1,377.75	$ 1,377.75

/s/ Carolyn M. Buff
Executive Secretary/Treasurer

We do hereby certify that we have examined the accounts and receipts of the Executive Secretary/Treasurer, and find them to be correct; and that the balance in her hands is $26,841.11. Date: April 27, 1996.
/s/ Mary Lou Larson
/s/ Julie Francis
/s/ Mary Hopkins

WAS SCHOLARSHIP WINNERS, 1969-1996

The following is the list of Wyoming Archaeological Society Scholarship winners compiled from minutes of the annual meetings. Listed are the names of the recipient, which scholarship, the year, and the amount if available. Those amounts marked with an asterisk (*) are estimates based on comments made in the society minutes about the 1974 recipients. Charles Reher, Mary Lou Larson, Dave Reiss, and Larry Todd were all consulted and they all felt sure their awards were around that $300.00 area, or as marked on the listing. You will notice that with these estimates, the total amount for all scholarships since 1969 is $13,900; without these estimates, the total amount I can positively document from meeting minutes is $9,200.

YEAR	RECIPIENT	SCHOLARSHIP	AMOUNT
1969	Charles Reher	Mulloy	$300.00 *
1970	John Lytle	Mulloy	$300.00 *
1971	Ross Hilman	Mulloy	$300.00 *
1972	George Zeimens	Mulloy	$300.00 *
1973	George Zeimens	Mulloy	$300.00 *
1974	Debbie Foster	Mulloy	$150.00
	George Zeimens	Mulloy	$150.00
1975	Mark Miller	Mulloy	$300.00
1976	Susan Hughes	Mulloy	$300.00*
1977	Kim Smiley	Mulloy	$300.00*
1978	Julie Longenecker	Mulloy	$350.00*
	Mary Lou Larson	Mulloy	$350.00*
1979	Dave Darlington	Mulloy	$300.00*
1980	Dave Darlington	Mulloy	$300.00*
1981	Allen Darlington	Mulloy	$250.00*
	David Reiss	Mulloy	$250.00*
1982	Carolyn Craig	Mulloy	$300.00*
	Lawrence Todd	Mulloy	$300.00*
1983	Howard Haspel	Mulloy	$350.00
	Dale Wedel	Frison	$350.00
1984	Dave McKee	Mulloy	$350.00
	William Eckerle	Frison	$350.00
1985	Cristi Ann Zimple	Mulloy	$350.00
	Karen G. Miller	Frison	$350.00
1986	Jennifer Woodcock	Mulloy	$350.00
	Elizabeth Cartwright	Frison	$350.00
1987	NO AWARDS		
1988	Debra Ann Swearingen	Mulloy	$300.00
	Kyle C. Baber	Frison	$300.00
1989	Michael Stafford	Mulloy	$350.00
	Jay Meyer	Frison	$350.00
1990	Laura Scheiber	WAS	$300.00
	Ruth Shephard	Mulloy	$300.00
	Cynthia Webb	Frison	$300.00
1991	Don Davis	Mulloy	$300.00
	Kristina McMahan	Frison	$300.00
1992	Laura Scheiber	not designated	$300.00
	Matthew Hill	not designated	$300.00
	Barbara Barrows	not designated	$300.00
1993	NO AWARDS		
1994	Karen Rogers	Mulloy	$300.00
	Alan Wimer	Frison	$300.00
	Laura Niven	WAS	$300.00
1995	Judson Finley	Mulloy	$300.00
	Patrice White	Frison	$300.00
1996	Christopher Hall	Frison	$400.00
	Carol-Anne Garrison	Mulloy	$40.00
	TOTAL		$13,900.00

PRELIMINARY ANNOUNCEMENT

THIRD BIENNIAL ROCKY MOUNTAIN ANTHROPOLOGICAL CONFERENCE

18-20 SEPTEMBER, 1997

HOLIDAY INN, BOZEMAN, MONTANA

The Third Annual Rocky Mountain Anthropological Conference will be held in Bozeman, Montana on September 18-20 of 1997. Now is the time to start planning to attend this important regional conference. Interested individuals are encouraged to organize forums as a possible alternative to symposia, to enable thoughtful, focused, and more open discussion of carefully delineated themes/topics. Please contact the conference organizers for information about organizing a forum. The organizers of the conference encourage the participation of individual researchers from all areas of anthropological study pertaining to the Rocky Mountains. Researchers in related fields addressing issues of past environmental conditions are also welcome.

Deadline for symposium or forum proposals is 15 March 1997. Other deadlines and information will be announced in future communications.

Organizers are:

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National Park Service
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Phone: 402/437-5392 x139
Fax: 402/437-5098
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ANNOUNCEMENTS

The following announcements were submitted courtesy of Richard Adams, co-editor of the Wyoming Association of Professional Archaeologist's Newsletter.

1996 PLAINS ANTHROPOLOGICAL CONFERENCE

The 54th annual Plains Anthropological Conference will be held October 30 - November 2 in Iowa City, Iowa. Contact Carrie Kiser Wacker at 319-335-3231 for additional information.

VANDALISM UPDATE

The notes on archaeological looting in the last issue of *The Wyoming Archaeologist* were prepared by Wil Husted for the Montana Archaeological Association Newsletter. Wil's assistance in compiling the information was greatly appreciated.

It Does Happen Here In a grim reminder of the damage caused by archaeological site looters, Rawlins Chapter WAS members, State, BLM, and consulting archaeologists attempted to stabilize the Aimee Eaton bison kill in Carbon County in July. Of an estimated 150 m^2 of bone bed, roughly 120 m^2 had been completely destroyed. Volunteers boxed up bushels of loose bone. State Archaeologist Mark Miller said: "Of the four known bison kills in Carbon County, three have been vandalized." This is the worst case of archaeological looting known to have occurred to a Wyoming archaeological site in recent years.

HELL GAP UPDATE

As far as he is concerned every June from now on will be Hell Gap month, said Dr. George Frison, co-director of the Hell Gap Revisited project in southeastern Wyoming. This year nearly one hundred excavators, specialists, and volunteers participated in on-going research at this Paleoindian site in the Haystack Hills at the southeastern part of the Hartville uplift.

"It was a very productive season at Hell Gap and we were extremely fortunate to have Vance Haynes at the site. He is one of the premier geoarchaeologists in North America," said Frison. Haynes' first professional job was documenting Hell Gap's complex stratigraphy and Quaternary geology for Henry and Cynthia Irwin in the 1960s. Many advances in geoarchaeology have occurred since then.

Haynes has contributed over 20 AMS dates in the last three years, according to Frison. The dates range from 1,000 BP to 13,060 BP, including 14 in the Paleoindian period. Haynes and his students do the costly pretreatment procedures of the samples which are then dated at the University of Arizona accelerator facility. Haynes' radiocarbon work is supported by a National Science Foundation grant.

Frison and Haynes decided to dig a new trench across the main arroyo and west of Locality II to better understand terrace development and geologic and cultural stratigraphy. With the backhoe, Frison exposed Late and Archaic hearths. Further west, beneath the highest terrace are numerous buried Paleoindian cultural levels. A Late Paleoindian projectile point (probably Frederick or Lusk) was discovered in a rich cultural level 40 cm below surface. The Pleistocene - Holocene contact was apparent as a thin black stratum almost 3 m below surface, said Haynes. According to Frison and Haynes, this area of the site has potential possibly equal to Locality I for research. Future plans include more trenching and some limited excavation in Locality II.

Frison, whose volume on the Mill Iron Goshen site in Montana was recently released by

UNM press, says that better definition of the Goshen level in Locality I is a priority. A complete Goshen point was found during the 1960s excavations, but the point has since been lost and all that remains is a photograph. This summer, portions of 11 m^2 were excavated by paid staff and trained volunteers under the direction of Drs. Mary Lou Larson and Marcel Kornfeld. A complete Alberta point and several tools were found in situ. Several excavation units reached the bottom of the Goshen level, according to Kornfeld. Artifacts were mapped in place with an EDM while cataloging and preliminary analysis took place in an on-site laboratory.

Dr. Robson Bonnichsen of the Center for the Study of the First Americans at Oregon State University along with trained excavators and Earthwatch volunteers spent about two weeks excavating in Locality I. They sampled a column that stretched from the ground surface to 50 cm below the Goshen level. Bonnichsen, who has found human and animal hair preserved in boggy deposits at the Mammoth meadow site in Montana, is anxious to see if hair is preserved in Hell gap's drier sediments. As this issue went to press, Frison said Bonnichsen has found hair of yet undetermined genus.

An open house June 21-23 attracted more than 75 visitors ranging from field schools to members of the Wyoming Archaeological Society to professionals from the region, the nation and internationally. In addition to attracting visitors, the co-directors have attracted individual donations of material, time and money as well a pledge from a benefactor to match up to $10,000 in annual contributions. Frison, Kornfeld and Larson hope that Hell Gap month will become a tradition every June.

WAPA FALL WORKSHOP/MEETING

A GPS (Global Positioning System) training session for WAPA and WAS members will be the continuing education highlight of the 1996 Fall WAPA meeting, October 25 and 26, at the new Headwaters Convention Center in Dubois. Professionals, avocationals and students are encouraged to attend.

BLM geodicist Mike Londe and UW Geography Professor Dr. Bill Gribb will provide hands-on training in Global Positioning Systems technology (GPS) to interested WAPA and WAS members, Friday, October 25 from 12 to 5 pm. Organizer Mary Hopkins hopes to have at least one GPS receiver for every three participants. Londe, with over 10 years GPS experience, teaches geodesy to land managers, professionals, and surveyors. Gribb worked with Fred Plog on applications in recording rock art sites in New Mexico and currently teaches GPS at UW.

The WAPA executive meeting will be held at 11 am, Friday October 25 at the Headwaters Convention Center. A lunch catered by Yellowstone Garage (a restaurant despite its name) is included in the registration. After lunch, the GPS training session will be held in the Dinwoody Room of the convention center.

Friday night there will be an open house at the Rocky Mountain Bighorn Sheep Center from 7:30 to 9 pm. The Wind River Valley Artist's Guild will also have an open house. They are located in the Headwaters Convention Center.

On Saturday morning, from 8 to 10 am, the WAPA general meeting will discuss items of business. A field trip, to demonstrate GPS technology, is scheduled to begin at 10 am lasting until ?. Possible destinations include the Helen Lookingbill site (stratified campsite in the mountains) or the Torrey Lake petroglyphs. Pack your own sack lunch.

A block of rooms has been reserved at the Twin Pines Lodge (307-455-2600) and at the Super Eight Motel (307-455-3694 or 1-800-800-8000). Remember it's going to be elk season so reserve your room early.

Mary asks that you sign up for the workshop by October 11. The cost for the workshop, lunch and coffee is $10, payable to WAPA. Send your $10.00 registration to Mary Hopkins, SHPO, 410 S. 3rd St., Laramie, Wyoming 82070. 307-766-5324.

THE BOZOVICH FAMILY ARCHAEOLOGICAL COLLECTION

by
JOE BOZOVICH

ABSTRACT

The Bozovich family archaeological collection contains over 5,000 surface-collected artifacts from 712 sites in southwestern Wyoming during the period between 1932 and 1992. All the artifacts were cataloged with their own catalog number. Data were then entered into an IBM-PC computer using the Dbase III (r) software program. Specific objectives were to:

1. Place all artifacts into approximate archaeological time periods.
2. Make sets of tables for various time periods on: artifact types; retouch and basal grinding; artifact sizes; material types; material colors; flaking patterns; and parts missing.
3. Create graphs for frequency of the various artifact types.
4. Create graphs and bell curve displays for length variability of the various artifact types.

With a collection of this size there is a great deal of research potential to be realized as shown in this paper.

INTRODUCTION

This paper focuses on the Bozovich family collection of over 5,000 artifacts cataloged, and 712 sites plotted on U.S.G.S. quadrangle maps.

In the beginning of the cataloging a special 5" x 8" artifact card was designed as shown.

INDEX #:	MISSING:
SITE #:	RETOUCH:
TYPE:	FLAKING:
SHAPE:	FLUTE:
MATERIAL:	LENGTH:
COLOR:	WIDTH:
GRINDING:	THICKNESS:

The right-hand side of each card was used to provide general remarks, observations, special drawings of unusual artifacts, and specification of storage cabinet and tray. Data for each artifact were entered on a single card. It should be noted that artifact thickness measurements were not made. All artifact cards were stored in special card files.

Artifacts were displayed in two special cabinets with numbered one-inch high trays. Artifacts displayed in the cabinet were either complete, or nearly so, or had some unusual shape. All small pieces not displayed were cataloged on pieces cards and stored in special containers.

Special site cards were made and placed on file for each of the 712 sites. InterMountain Antiquities Computer System (IMACS) cards were also developed for each site (see Bozovich 1985) for a more detailed description of the cataloging methods used).

After development of the cataloging system, the completed inventory of the collection was entered into the Dbase III database system. Then library research was conducted with published sources relating artifact styles and shapes to recognized archaeological periods (Bureau of Land Management 1981; Creasman et al. 1991; Drager and Ireland 1983; Frison 1978, 1991).

In using these sources it was usually, but not always, possible to determine the type and the likely archaeological age of the particular artifact. Because many artifact shapes are related to multiple site names, only a few names in com-

mon usage were used in this paper. More generally, the artifacts were described by shape, and in the case of projectile points, the base style. Artifacts were categorized by style to approach relative archaeological age, since no radiocarbon dating was available for any of the sites.

ARTIFACT STYLES AND FREQUENCIES

The large amount of data presented in the appendices provide a wide variety of possibilities for analysis. There are several ways of looking at the data, as shown by the accompanying figures. These figures attempt to answer the questions of what varieties of artifacts exist, and what summaries can be drawn.

The frequency of artifacts by major tool category is displayed first (Figure 1). Projectile points represent about 75% of the total. This is probably not surprising for a surface collection. Often non-projectile tools are not recognized or are overlooked. However, it probably does properly emphasize the importance of killing tools in many of the sites covered. The ratio of drills to knives is also somewhat surprising.

A variety of drill base styles and quantities of each complete artifact can also be documented (Table 1). Similarly, the variety of scraper styles and quantities of each complete scraper style has been calculated (Table 2).

DRILL TYPE	COMPLETE	TOTAL
Bone	5	5
Concave base	2	5
Convex base	18	40
Corner-notched base	1	4
Expanding base	12	21
Miscellaneous base	4	33
Oval base	7	16
Paleo	2	3
Side-notched base	2	10
Square base	9	14
TOTAL	62	151

Table 1: Drill types present in the Bozovich family collection.

Besides the formal, "classic" tools, many minor tools were collected from these same sites (Figure 2; see Appendix 1 for type names). These are miscellaneous items less frequently found. There is an obvious limitation to this data as one looks at only 44 utilized flakes. There would be many more such flakes in the collection if every flake was collected and inspected. These particular flakes were collected because they possessed an excellent level of fine retouch. The count of other minor artifacts, however, probably does measure their frequency rates in this part of Wyoming. Note that the occurrence of pottery is also quite low for so many decades of surface hunting.

SCRAPER TYPE	COMPLETE	TOTAL
Bone	1	1
Endscraper	399	405
Hafted scraper	22	25
Paleo	19	19
Scraper	23	25
Scraper with end/side chipping	39	40
Sidescraper	76	81
TOTAL	579	596

Table 2: Scraper styles present in the Bozovich family collection.

I have plotted the frequency of projectile point styles (Figure 3). This includes all points regardless of the presumed archaeological period to which they might belong, not including presumed Paleoindian artifacts.

Note that the corner-notch base style dominates the statistics with almost 50% of the total. A puzzling ratio is that of McKean lanceolate versus Duncan. Generally these are associated together, but in this collection, Duncans significantly outnumber McKeans lanceolate.

All Duncan, Oxbow, Elko split-stem and Hanna were grouped together. Their bases nearly all look alike. It is probable that an error in attribution could have been made in some, but there probably was a slow transition between styles. Possibly the preferred base style evolved

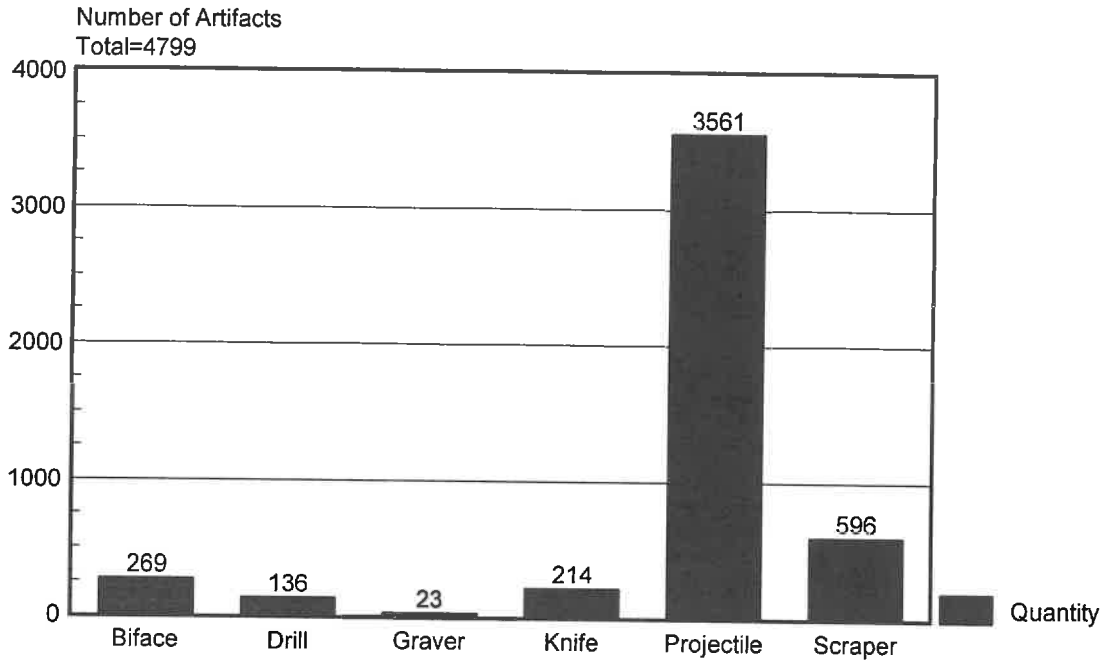

Figure 1: Major tool artifact frequencies, by type, from the Bozovich family collection.

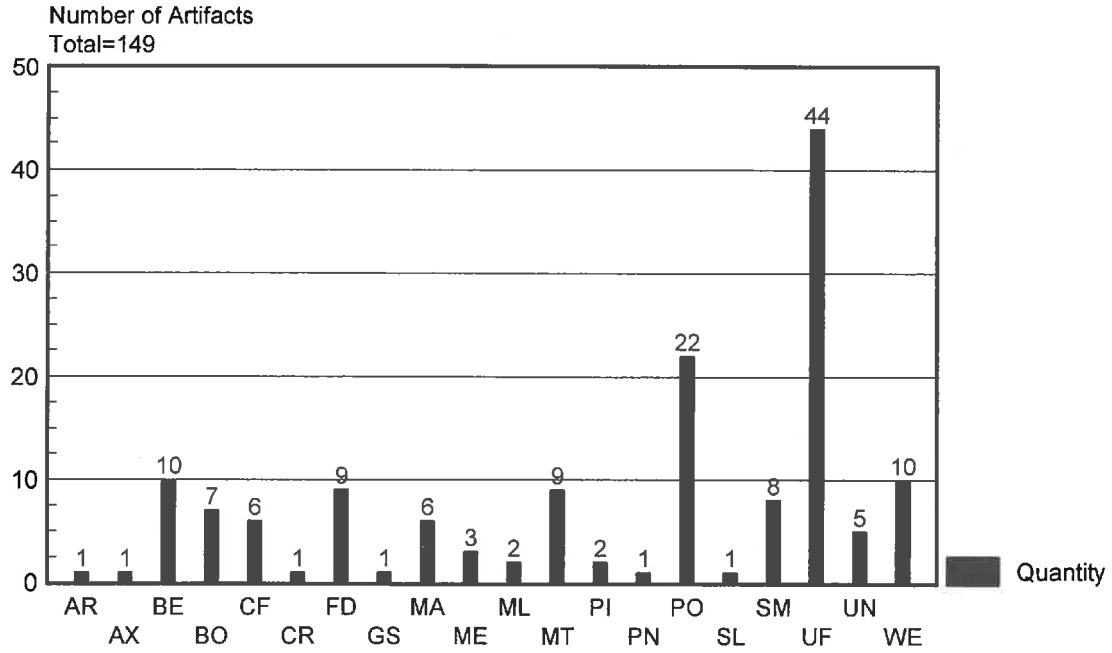

Figure 2: Minor tool artifact frequencies, by type, from the Bozovich family collection.

along with changes in hafting techniques.

I also plotted relative occurrences of Paleoindian artifacts by named types (Figure 4). The most intriguing data point would seem to be that of the high number of Agate Basin versus Cody styles. There are not many official Agate Basin sites in this part of Wyoming. The Pine Springs site contained some Agate Basin projectile points. There is a strong possibility of an Agate Basin site with a Goshen component on North Table Mountain. The Finley site is famous as a Cody complex site. It is possible that some projectile points identified as Agate Basin are similar in shape but are actually several thousand years later in date.

The unnamed category includes side-notch, corner-notch, concave base, convex base, and square based projectile points that are clearly Paleoindian artifacts. However, they are not identified as a specific named projectile point.

The fragments are all pieces that are hard to identify as to type of projectile point and include bases, mid-sections and tips. They are classified as Paleoindian because of the presence of basal grinding, fine retouch, size, and general Paleoindian nature of the quality of workmanship.

The frequency of material type in all the artifacts in the collection was also plotted (Figure 5). The dominance of chert is not surprising as the material always is a favorite due to workability. The infrequency of obsidian is somewhat surprising. Additional issues which would be worth pursuing include the under-representation of fine quartzite, and possible relationships between material and age, and between material and site location. These issues were not addressed in this study.

OBSERVATIONS ABOUT ARTIFACT LENGTHS

The relatively large number of artifacts in this collection provided a suitable statistical basis for analyzing artifact length variations by major type, as shown in the following figures. Each figure contains information about complete artifacts in the collection. Other attributes, such as weight, are also important in distinguishing artifact types. Similarly, reworking of artifacts

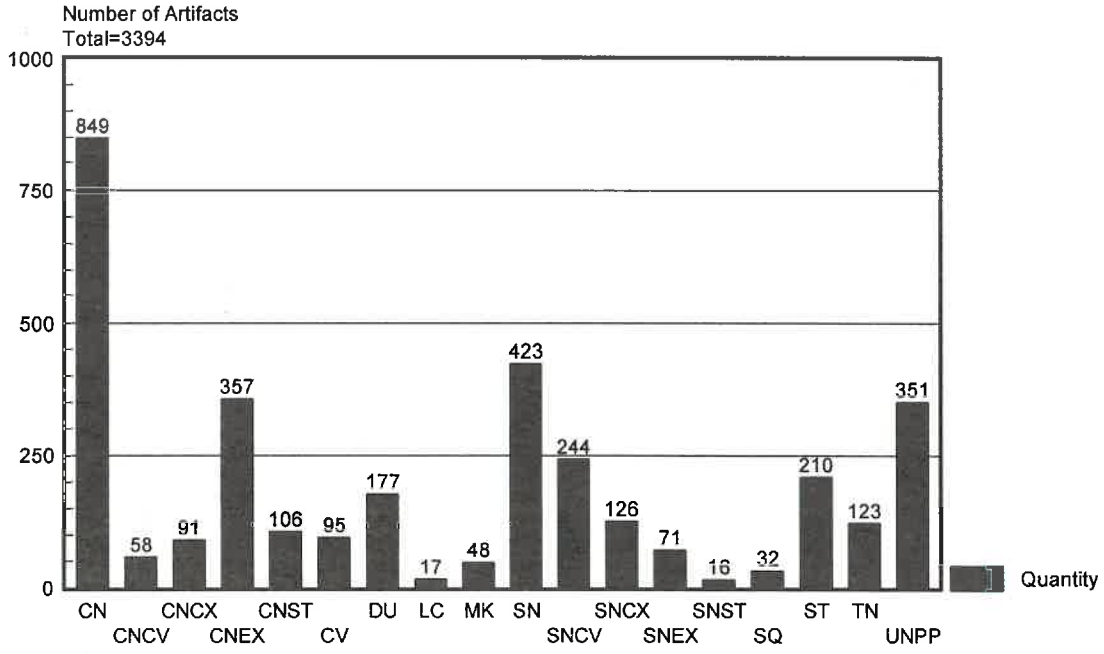

Figure 3: Projectile point frequencies, by type, from the Bozovich family collection.

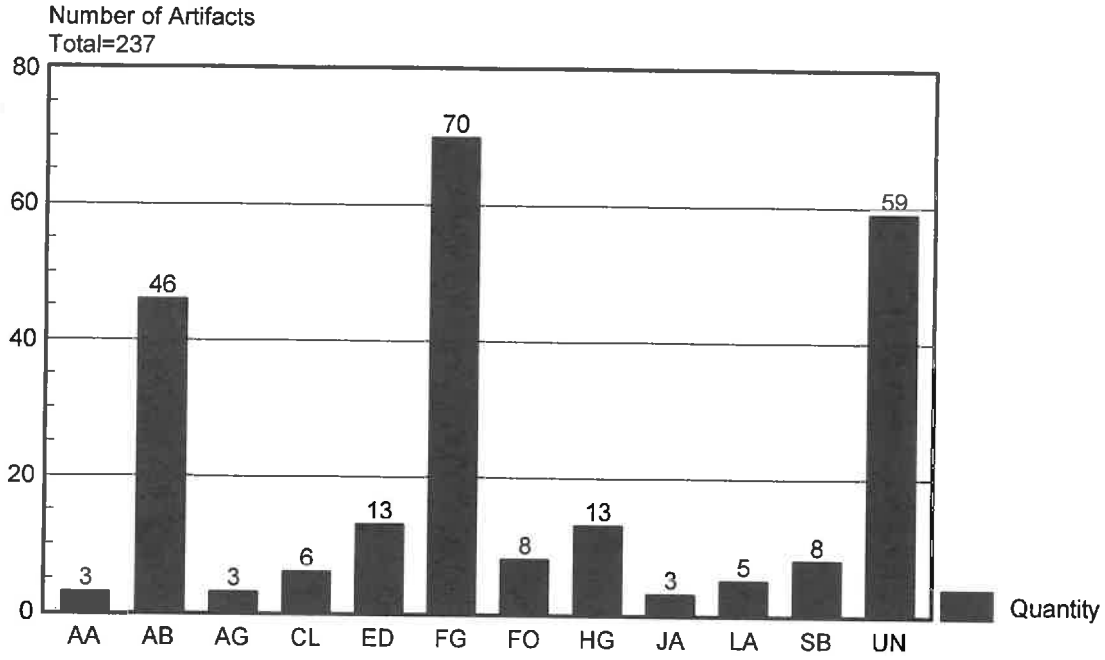

Figure 4: Paleoindian artifact frequencies, by type, from the Bozovich family collection.

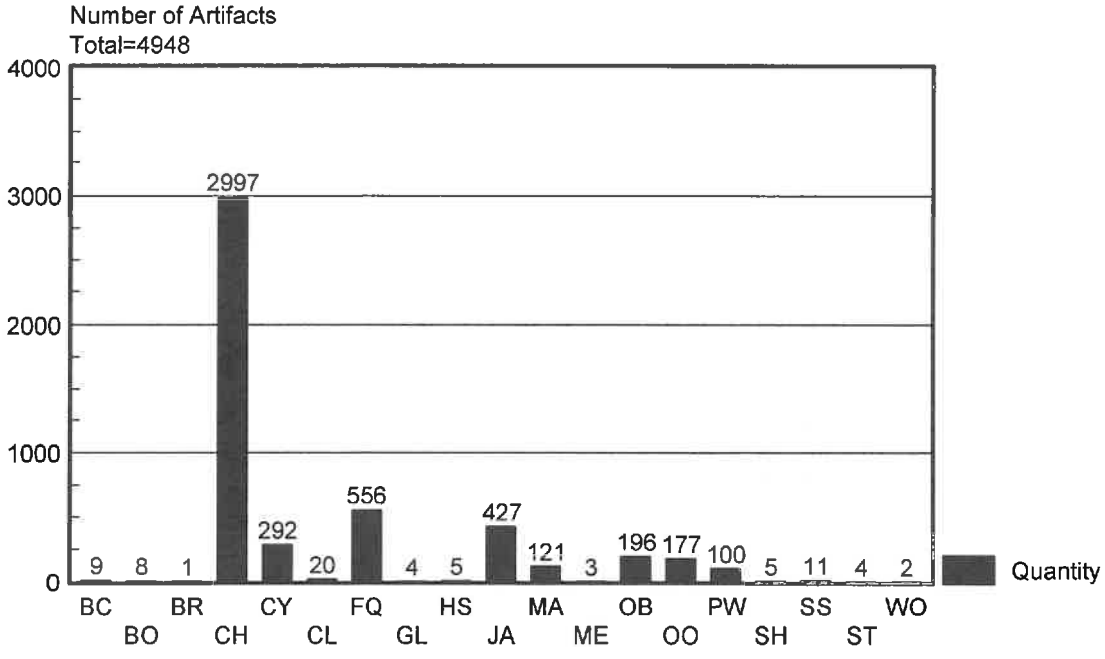

Figure 5: Artifact material frequencies, by type, from the Bozovich family collection.

may have a major affect on stylistic appearance of an artifact. However, only length is considered here, to illustrate the types of studies that could be conducted on such a collection.

The range of lengths for complete corner-notch artifacts in this collection was plotted (Figure 6). The corner-notch bell curve shows a high arc change in the length of the artifacts, starting at 22 mm, peaking at 30 mm, then dropping down at 52 mm. The different sizes could very well have been used with the bow and arrow. The bell curve for corner-notch artifacts is nearly the same as that for the side-notch (Figure 7). Probably either shape could be used very well with similar results, although it seems that side-notch points would be much easier to fasten to any kind of shaft.

The number of artifacts in the 25 mm to 35 mm size range is interesting. Perhaps that particular size was more effective in the flight pattern or achieved better penetration. From 70 mm to 85 mm, we also have a small rise in the curve. It is possible that these sizes were used on the atlatl or thrusting spear. Other possibilities are that these unusually long specimens are from earlier time periods, or are knives. All the sizes could very well be used for killing any type of animal, large or small.

The same type of length variability can be seen for side-notch points (Figure 7). In this case, there is again a group of outliers in size. The bell curve shows a high arc change in the lengths of the artifacts, starting at 18 mm, peaking at 30 mm, then dropping down to 42 mm. This seems to be a normal curve. Any of the above sizes could be used with the bow and arrow. The variations of the different sizes could be used for killing most any type of animal, large or small. After 40 mm, the curve starts to drop quite fast to 65 mm, since there are far fewer of this length. It is possible that these sizes were used with the atlatl. From 65 mm to 90 mm, we have a small rise in the arc. These sizes could very well be fastened on a thrusting spear or an atlatl. The artifacts in the 85 mm to 100 mm range might have been used as knives.

The number of artifacts in the 30 mm length

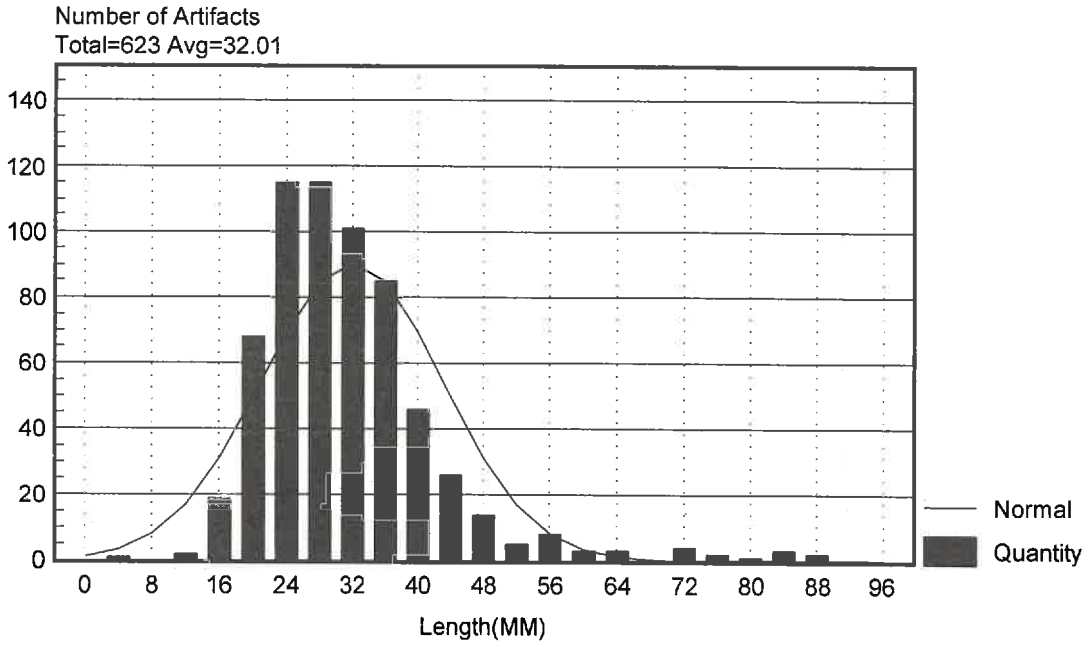

Figure 6: Corner-notched artifact length variability, for all periods, from the Bozovich family collection.

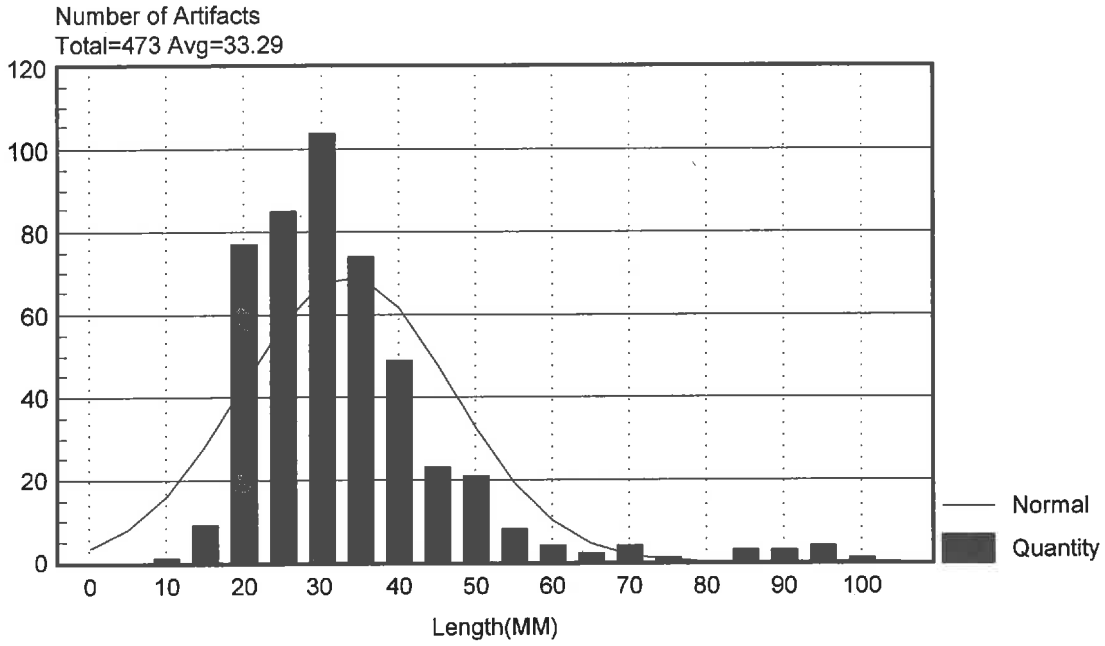

Figure 7: Side-notched artifact length variability, for all periods, from the Bozovich family collection.

is very interesting. Perhaps that particular size was more effective in the flight pattern, had better balance, or had improved penetration. In summary, the makers of side-notch and corner-notch artifacts seemed to choose about 30 mm as the most popular length.

The length variability for unnotched artifacts was plotted (Figure 8). This figure is based on unnotched artifacts including blanks, preforms and artifacts such as Cottonwood and Plains Triangular points. In this case, there is a fairly normal distribution. The bell curve starts a normal rise at 20 mm, peaks at 35 mm, then drops as the length approaches 45 mm. There is one bar at 35 mm with a total quantity of 49 that reaches somewhat higher and seems to be the favored length. It is interesting that although the side-notch and corner-notch lengths cluster around 30 mm, there is greater variability in the unnotched lengths. Perhaps the unnotched artifacts had a wider range of uses. There is a possibility that the longer projectile points were used as knives, or are preforms on the way to smaller artifacts.

The endscrapers also exhibit a normal bell-curve distribution (Figure 9). The normal curve for this major tool begins at 20 mm, reaches a high arc at 39 mm, and then drops down to 75 mm. One can only speculate that the endscrapers above the normal curve were easier to grip while using.

The length variability for knives-type artifacts was also plotted (Figure 10). The normal curve begins at 30 mm, reaches a high arc at 75 mm, and then drops down to 150 mm. It is difficult to explain those artifacts which seem to be outside the normal range. (A discussion of various knife shapes and their origins is presented in the appendices.)

Biface length variability also shows a normal distribution, but with a large number of outliers on the upper end (Figure 11). The normal curve begins at 30 mm, reaches a high arc at 70 mm, and then drops down to 120 mm. It is possible that the bifaces above the normal curve are a favored size for gripping. The curve then starts another rise from 120 mm to 185 mm. These larger sizes could be from a different age, used

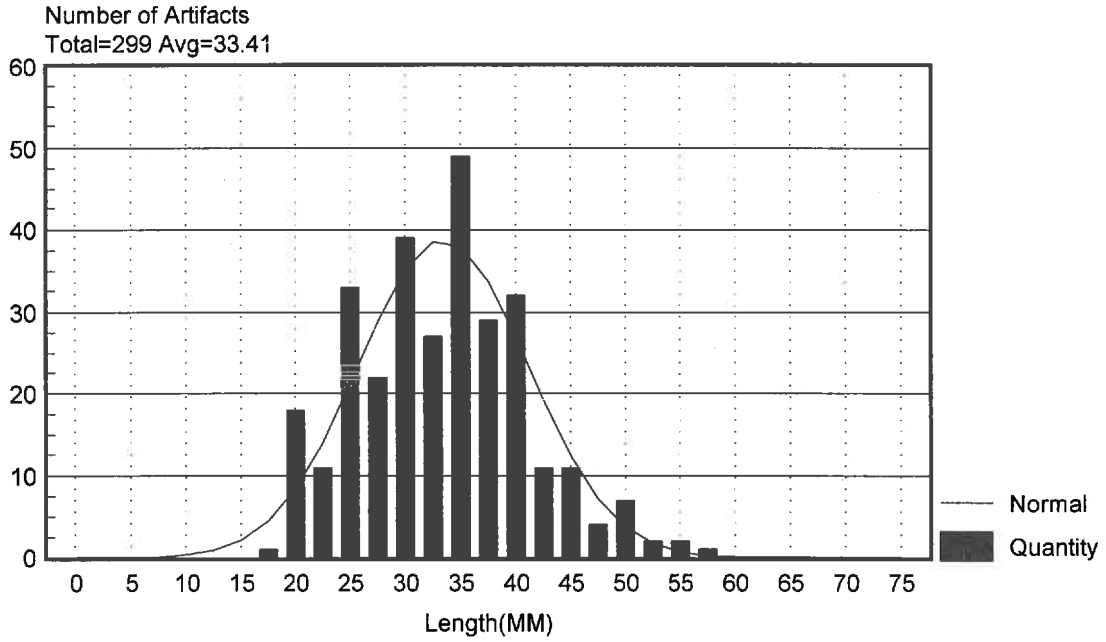

Figure 8: Unnotched artifact length variability, for all periods, from the Bozovich family collection.

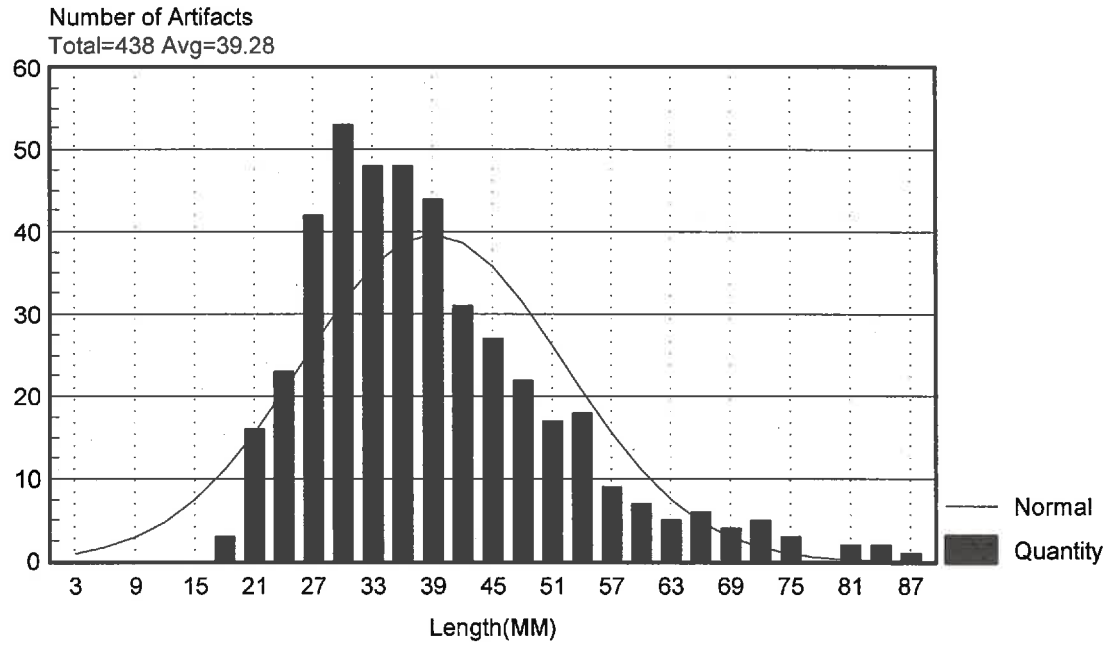

Figure 9: Endscraper length variability, for all periods, from the Bozovich family collection.

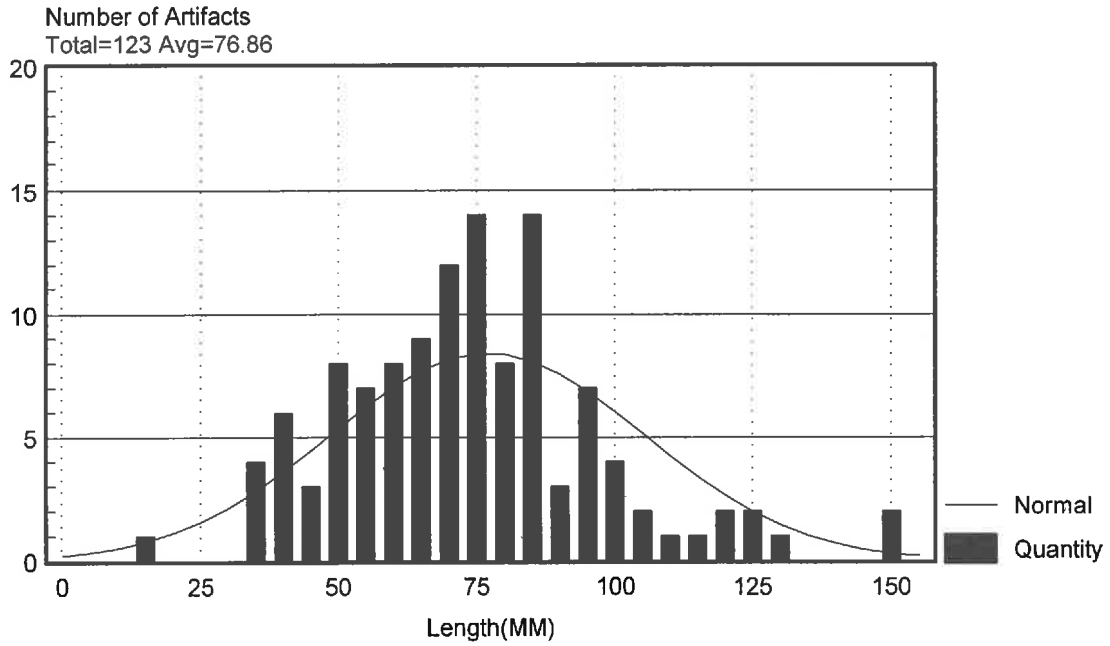

Figure 10: Knife length variability, for all periods, from the Bozovich family collection.

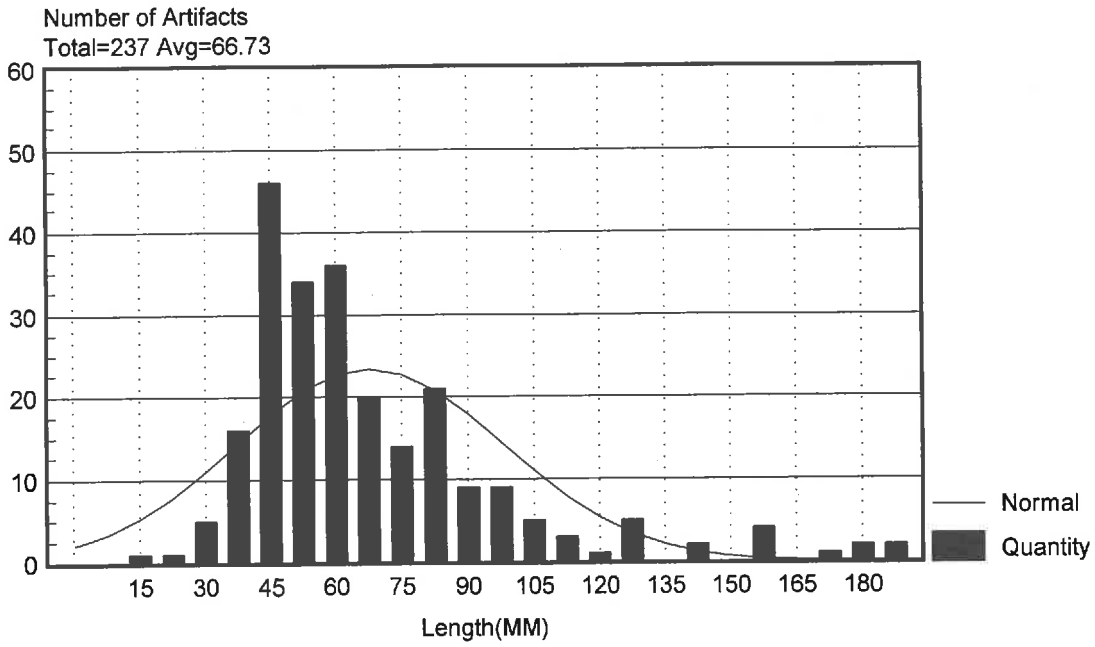

Figure 11: Biface length variability, for all periods, from the Bozovich family collection.

as knives, or easier to hold when used in the butchering of animals. Some of the bifaces have a small notch on each side two-thirds from the end, probably used in hafting. This artifact shape is clearly not well-represented by a "normal" distribution.

CONCLUDING REMARKS

Within this paper, only a broad overview has been presented, with certain interesting anomalies pointed out. The data available for further analysis have the potential to address important questions about the prehistory in southwestern Wyoming, for the professional and amateur alike. The appendices which follow contain tables of data for each time period showing each artifact type, the number of complete artifacts, the representative percent for the period, percent with retouch and basal grinding, and average size. There also are tables showing the use of material types, material colors, flaking patterns, and parts missing in each period. The possibilities for analysis have only been barely touched upon in this report. Much remains to be discovered, and as usual the number of mysteries expands as more data is analyzed.

ACKNOWLEDGMENTS

I would like to give special thanks to my son Joseph Bozovich for giving me advice and writing the special computer programs to do this project. Joe also made the displays of the graphs and bell curves for variability of various types of artifacts in all periods.

I would like to give special thanks to my granddaughters Carey Bozovich and Shelley Bozovich Boyson for their data verification, word-processing and editing efforts. I know they both have very busy schedules but they took the time to help me on this project. After I had written the article and made the different tables, Carey changed everything to a Microsoft Word for Windows (r) program thus making it easier to understand the complete article. Shelley worked hard on editing and grammar.

I thank Kevin Thompson, Director of Archaeological Services at Western Wyoming Community College for his technical advice on some of the problems that were encountered in doing the analysis of the Bozovich family archaeological collection.

I would also like to thank Russell Tanner, Resource Area Archaeologist for the Bureau of Land Management, Rock Springs, Wyoming for his technical advice in preparing this paper and for his suggestions as to additional research that can still be addressed.

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APPENDIX ONE
FIGURE LEGEND ARTIFACT ABBREVIATIONS

FIGURE 2 LEGEND

CODE	DESCRIPTION
AR	Arrow shaft
AX	Axe
BE	Bead
BO	Bone tool
CF	Channel flake
CR	Cradle board
FD	Fire drill
GS	Grinding stone
MA	Mano
ME	Metal point
ML	Maul
MT	Metate
PI	Pipestem
PN	Pendant
PO	Pottery
SL	Slitter
SM	Smoother
UF	Utilized flake
UN	Uniface knife
WE	Weight

FIGURE 3 LEGEND

CODE	DESCRIPTION
CN	Corner-notch
CNCV	Corner-notch with concave base
CNCX	Corner-notch with convex base
CNEX	Corner-notch with expanding base
CNST	Corner-notch with straight stem
CV	Concave base
DU	Duncan
LC	Lovell constricted
MK	McKean
SN	Side-notch
SNCV	Side-notch with concave base
SNCX	Side-notch with convex base
SNEX	Side-notch with expanding base
SNST	Side-notch with straight stem
SQ	Square base
ST	Straight stem
TN	Tri-notched
UNPP	Unnotched

FIGURE 4 LEGEND

CODE	DESCRIPTION
AA	Alberta
AB	Agate Basin
AG	Angostura
CL	Clovis
ED	Eden
FG	Fragments
FO	Folsom
HG	Hell Gap
JA	Jimmy Allen
LA	Lanceolate
SB	Scottsbluff
UN	Unnamed

FIGURE 5 LEGEND

CODE	DESCRIPTION
BC	Banded chert
BO	Bone
BR	Bark
CH	Chert
CL	Clay
CY	Chalcedony
FQ	Fine quartzite
GL	Glass
HS	Hard stone
JA	Jasper
MA	Moss agate
ME	Metal
OB	Obsidian
OO	Oolitic chert
PW	Petrified wood
SH	Shell
SS	Sandstone
ST	Steatite
WO	Wood

APPENDIX TWO
LATE PREHISTORIC AND PROTOHISTORIC PERIODS
DATED 150 B.P. TO 1500 B.P.

The developed statistics for this period is presented in this appendix (Tables 3 and 4). They provide the source for much subsequent analysis. Similar tables will be presented for each archaeological period. The data within the tables are presented in alphabetical order based on type. It should be noted that many of the artifact types and shapes can be associated with more than one archeological period. Without benefit of radiocarbon dating, it is impossible to conclusively assign each artifact to a certain period. For purposes of this study, artifacts with generic shape descriptions (such as corner-

ARTIFACT TYPE	RETOUCH PERCENT	BASAL GRIND PERCENT	AVG. LENGTH (MM)	AVG. WIDTH (MM)	COMPLETE	PERCENT	TOTAL
Arrow shaft	100	0	546	10	1	0	1
Axe	100	100	163	110	1	0	1
Bead	60	40	13	10	8	0	10
Biface knife *	10	0	67	36	241	8	269
Bone tool	14	29	82	21	7	0	7
Concave base *	45	3	29	18	43	3	95
Cornernotch *	39	0	30	19	302	25	849
Cornernotch w/straight stem *	41	2	27	16	62	3	106
Cradle board	0	0	471	164	1	0	1
Drill *	61	0	35	14	4	1	23
Drill w/convex base *	40	0	43	25	18	1	40
Drill w/cornernotch *	50	0	30	28	1	0	4
Drill w/sidenotch *	90	0	34	20	2	0	10
Endscraper *	20	0	38	29	399	12	405
Knife *	34	3	71	33	116	5	177
Mano *	100	100	189	69	5	0	6
Maul	100	100	143	84	2	0	2
Metal point	0	0	40	18	2	0	3
Metate *	89	100	440	237	8	0	9
Pendant	100	0	20	14	0	0	1
Pipestem	50	0	25	22	0	0	2
Pottery	23	9	44	35	0	1	22
Scraper *	26	0	59	36	23	1	23
Scraper w/end/side chipping *	40	0	54	31	39	1	40
Shoshonean biface knife	80	0	72	29	4	0	15
Sidenotch *	29	1	30	17	187	12	423
Sidenotch w/straight stem *	44	0	32	18	7	0	16
Sidescraper*	35	0	55	32	79	2	84
Slitter	100	0	25	16	0	0	1
Smoother	50	50	62	38	8	0	8
Straight stem *	37	1	30	16	112	6	210
Tri-notched *	59	1	24	15	62	4	123
Uniface knife *	80	0	69	30	4	0	5
Unnotched *	19	0	35	19	253	10	351
Utilized flake *	64	0	31	21	44	1	44
Weight	30	10	81	54	10	0	10
TOTAL			40	23	2055		3396

* Artifact can be from several different time periods.

Table 3: Late Prehistoric Period artifact type descriptions, from the Bozovich family collection.

MATERIAL TYPE	PERCENT	TOTAL
Banded Chert	0	9
Bark	0	1
Bone	0	8
Chalcedony	6	208
Chert	60	2038
Clay pottery	1	20
Fine quartzite	11	364
Glass	4	4
Hard stone	0	5
Jasper	9	295
Metal	0	3
Moss agate	3	85
Obsidian	4	148
Oolitic chert	4	119
Petrified wood	2	68
Sandstone	0	10
Shell	0	5
Steatite	0	4
Wood	0	2
TOTAL		3396

FLAKING PATTERN	PERCENT	TOTAL
Bi-bevel	0	4
Collateral	1	18
No chipping	2	69
Oblique	0	7
Random	78	2634
Transverse	20	664
TOTAL		3396

MATERIAL COLOR	PERCENT	TOTAL
Black	9	304
Blue	0	3
Brown	26	889
Clear	0	3
Cream	0	12
Gray	25	849
Green	1	21
Orange	6	188
Pink	2	51
Purple	0	12
Red	2	80
Rust	0	3
Tan	22	737
White	7	244
TOTAL		3396

PART MISSING	PERCENT	TOTAL
Complete artifact	61	2055
Base	5	160
Corner of base	2	60
Ear	3	110
Shard	1	23
Side of artifact	1	17
Tip	25	835
Tip and base	2	66
Tip and ear	2	68
Tip and side	0	2
TOTAL		3396

Table 4: Late Prehistoric Period artifacts material types, material color, flaking pattern, and missing parts, from the Bozovich family collection.

notched, side-notched, concave, etc.) have been assigned to a single period, with an asterisk noting that the type can be from several different time periods.

DESCRIPTIONS OF ARTIFACT TYPES USED IN THE LATE PREHISTORIC PERIOD; DATED 0 B.P. TO 1500 B.P.

Further detailing of the artifact types and relating of those types to available research material will now be presented in alphabetical order. The descriptions of artifact types are primarily extracted from the 1981 Artifact Identification manual from the Bureau of Land Management cited in the references. Similar descriptions will be presented for each archaeological period.

ARROW SHAFT

The single arrow shaft in the collection is made of willow, notched on one end with sinew tied near the notch, and more sinew near the center in two spots. The opposite end is rounded, possibly for a socket shaft, with artifact attached. There is slight green mold near one end, but the condition is excellent for further study. Dimensions are 21 1/2" in length and 10 mm in diameter. Dated Late Prehistoric period.

AXE

The double-bitted axe is made of pale-pink quartzite. Its shape is oval with a groove around

the center. Edges inside the grooves are ground smooth and both ends are battered from use. Found in cedar country, this type is very rare in southwestern Wyoming. Possible uses include butchering of animals, breaking bones, etc. Dated Late Prehistoric period.

BEAD

Beads include trade beads as well as bone and shell beads. A variety of material, color, shape and size for the various types of beads in this collection (Table 5). All of the glass trade beads are from the Late Prehistoric period, while the bone and shell beads are not easily dated. Two of the glass beads are strands of beads and were gifts. The three tan shell beads were found together in the same site.

BEAD MATERIAL	COLOR	SHAPE	LENGTH (MM)	WIDTH (MM)
Bone	White	Oval	12	10
Glass	Blue	Random	3	3
Glass	Black	Round	4	3
Glass	Purple	Round	16	5
Glass	White	Square	25	22
Shell	White	Oval	17	12
Shell	Gray	Round	14	14
Shell	Tan	Square	25	15
Shell	Tan	Square	12	12
Shell	Tan	Triangular	9	8

Table 5: Basic bead descriptions, from the Bozovich family collection.

BONE TOOL

Bone tools include drills and endscrapers. The color of all bone tools in the collection is white and gray. The frequency of each type of bone tool found in this collection has been calculated (Table 6).

BONE TOOL TYPE	TOTAL
Bone with cut marks	1
Drill	5
Scraper	1
Total	7

Table 6: Frequencies of bone tool types, Bozovich family collection.

CONCAVE BASE

COTTONWOOD TRIANGULAR This type of artifact quite often has a concave base. Blade length varies from 15 mm to 28 mm. Dated about ca. 850 A.D.

PLAINS TRIANGULAR This type of artifact is unstemmed and unnotched and some have a concave base. Quite often you find these concave points in the same areas as tri-notched points. It is believed that the Shoshonean Indian made this type of arrow point. Dated ca. 850 A.D.

CORNER-NOTCHED

ELKO CORNER-NOTCHED These projectile points are triangular and medium sized. The blade edges range from straight to gently convex. The expanding stem is always narrower than the blade. The base is generally straight or slightly convex. Dated ca. 3000 B.P. to historic times.

GLENDO POINT Glendo points are thin and well flaked with a lenticular cross section. The edges are straight or slightly convex, never dulled by grinding. Flaking is irregular with a fine marginal retouch. Sizes range from 13 mm to 44 mm in width and from 20 mm to 102 mm in length. Glendo points seem to have prevailed in the northwestern plains for many centuries with only minor changes. Dated ca. 1000 B.C. to 2000 B.C.

CORNER-NOTCHED WITH STRAIGHT STEM

MUMMY CAVE CORNER-NOTCHED Narrow stems are produced by deep, moderately wide notches placed at the base corner area. Stems usually extend beyond the shoulder barbs. Dated ca. 1110 A.D.

ROSE SPRING CORNER-NOTCHED OR SIDE-NOTCHED Blade edges are straight to gently convex. Stems are almost always slightly expanding. The length ranges from 20 mm to 35 mm. This is a Fremont type point associated with Desert Side-notched, Cottonwood Triangular and Eastgate expanding stems. Dated ca.

400 A.D. to 2500 B.C.

CRADLE BOARD

The cradle board is made from a large oval piece of bark that is bowed slightly to a width of 164 mm and is 471 mm long. It has several holes, presumably for tieing the baby to the board. One end is rounded and the other end is a slightly pointed curve. It is thought to be a burial cradle board. Dated late prehistoric period.

DRILL

Drills are bifacially reduced artifacts with long, thin distal ends that have been flaked laterally to produce a nearly circular or thick, biconvex cross section, as opposed to thinned edges. The drill was used for making holes in the sewing of garments for wear and very possibly for other uses. Dated late prehistoric times to present.

DRILL WITH CONVEX BASE Drills with a convex base were possibly made in that shape for ease in gripping, whenever in use. No signs of hafting wear were noted.

DRILL WITH CORNER-NOTCH Some drills are made with a corner-notch for ease of fastening to a handle or shaft, making them much easier to manipulate. Some drills were probably made by resharpening projectile points repeatedly until they became drills.

DRILL WITH SIDE-NOTCH Other drills are made with a side-notch also for ease of fastening to a shaft. It is possible that some tribes preferred side-notched tools rather than corner-notched tools.

KNIFE

Knives made with a point on one end are called acuminate blade shape. Bi-pointed knives have a point on both ends. The cross-section is usually biconvex. Some knives are beveled alternately, some beveled unilaterally, some beveled bilaterally. Knives made in various sizes were used in all the different periods. Knives were made in five different stages: Tested Material; Preblank; Blank; Preform; and Final Biface.

BIFACE KNIFE A biface in its final form is thin in cross-section with fine edge retouch. The cross-section is usually biconvex lenticular. Presumably the larger bifaces would be easier to hold when used in the butchering of animals. It is possible that some of the bifaces and knives were hafted to make them easier to hold and control.

SHOSHONEAN BIFACE KNIFE Shoshonean biface knives were made on a leaf shaped biface. Then both blade edges were resharpened bilaterally. The blade was resharpened many times until sometimes the blade became so thin that it broke and was discarded. The cross section is usually biconvex (Frison 1978:80-81, 1991). Dated ca. 1400 A.D.

UNIFACE KNIFE Uniface knives are usually smooth and flat on one side with flaking on the opposite surface. They were usually shaped and constructed in the same manner as biface knives.

MANO

These manos are the loaf-shape type, polished on one, two or three sides.

MAUL

A maul is a tool used for breaking bones to get to the bone marrow. In this collection, one specimen is 5 1/2" x 3 3/4" and weighs 3 1/2 lb. The other specimen is 5 3/4" x 2 7/8" and weighs 1 1/4 lb.

METAL POINT

Metal projectile points are usually found with small tri-notched and side-notched projectile points. Dated protohistoric times.

METATE

These metates are called basin metates, shaped by flake removal around the edges. The centers are pecked and have a smooth polish.

PENDANT

The pendant in this collection is made from obsidian and has three side-notches.

PIPESTEM

The pipestems in this collection are fragments made from steatite.

POTTERY

Pottery is made from clay shaped while moist and soft, then hardened by heat. All small parts of pottery are called shards. Colors are usually gray, but sometimes they are black from fires used when cooking. The collection contains 18 side pieces and 4 rim pieces.

SCRAPER

ENDSCRAPER The endscraper is an artifact that has been unifacially reduced by removing flakes which extend completely across one face of the artifact. These artifacts may exhibit bifacial retouch, but more commonly unifacial retouch will be on the reduced face. The cross-section may vary according to size and type of material. Some endscrapers were probably hafted. Very small scrapers are sometimes called fingernail scrapers.

END OR SIDESCRAPER These scrapers are end and side worked flakes with no facial reduction and retouched on at least one side and one end. The right or left lateral should be noted for side worked retouched flakes.

SIDESCRAPER Sidescrapers in this collection are about 15 mm longer than the endscrapers. Most of the sidescrapers are side worked flakes with no facial reduction and with retouch on one or more sides.

SIDE-NOTCHED

AVONLEA POINTS Avonlea points can be described as well-made triangular points with shallow parallel flaking that extends from the lateral edge to the midpoint. Notches are "U" or "V" shaped, usually small and placed low on the blade. Length ranges from 11 mm to 39 mm. Dated about ca. 220 A.D. to 660 A.D.

BESANT Besant points may be either side-notched or corner-notched, but they are primarily a side-notched artifact. Notching is perpendicular to the long axis. Stems are short and slightly expanded, with rounded tangs. The base is slightly concave and both sides of the blade are completely retouched. Blade length ranges from 22.5 mm to 75 mm. Dated ca. 100 A.D. to 700 A.D.

DESERT SIDE-NOTCHED These small triangular side-notched points generally have straight or occasionally gently convex edges. The base is most often deeply concave and occasionally notched. Length varies from 19 mm to 33 mm. Dated ca. 1400 A.D.

PLAINS SIDE-NOTCHED These small triangular points have deep side-notches. The notch is placed higher up the blade than the width of the notch. Bases are concave or straight. Length ranges from 10 mm to 33 mm. Dated ca. 1775 A.D. to 150 A.D.

REED POINT The Reed point is a relatively small projectile point characterized by side-notches placed near the base. Distinctive features are the edges below the notches. These edges are either parallel or curved in towards the base. The base is concave, straight or convex, sometimes dulled by grinding. Blade length ranges from 20 mm to 45 mm. Dated ca. 500 A.D. to 1000 A.D.

SIDE-NOTCHED WITH STRAIGHT STEM

These artifacts resemble Besant points. They can be side-notched or corner-notched. Notching is either "U" or "V" shaped, fairly shallow, and perpendicular to the long axis. Stems are short. Dated ca. 100 A.D. to 700 A.D.

SLITTER

The slitter in this collection is a very small knife 25 mm in length and 16 mm in width. The blade is curved and has a notch on the corner. It was probably fastened to a shaft and used to butcher small animals such as rabbits.

SMOOTHER

The smoother or abrading stone is made of sandstone, with a groove in the center running the full length of the stone. This stone is used to smooth the arrow shaft, to reduce the air resistance of the arrow in flight.

STRAIGHT STEM

Straight stem artifacts have slender triangular bladed points and slender stems. Stems project at an angle from the long axis of the point making the points asymmetrical. They resemble the Pine Spring Wyoming points and the Fre-

mont Island Utah points. Blade lengths average about 25 mm. Dated ca. 500 A.D. to 1100 A.D.

TRI-NOTCHED

DESERT SIDE-NOTCHED These are small triangular side-notched points, occasionally notched on the base. The stem is always expanding and wider than the blade. The base is quite often concave. This type of arrow point was used by the Shoshone. Length varies from 19 mm to 33 mm. Dated ca. 1400 A.D.

EMIGRANT This basal-notched variety is a typical plains side-notched point, marked by a notch in the center of a straight base in addition to the two side-notches. Dated ca. 1350 A.D.

HARRELL POINTS Harrell points are triangular arrow points having edges that are nearly straight or slightly convex. Dated ca. 1100 to 1500 A.D.

UNNOTCHED

COTTONWOOD TRIANGULAR Cottonwoods are small triangular stemless projectile points. Edges are occasionally convex or concave. Dated ca. 850 A.D. to 1500 A.D.

PLAINS TRIANGULAR These points are triangular, unnotched and unstemmed. Blade length varies from 15 mm to 25 mm. Dated about ca. 850 A.D.

CONVEX BASE Some unnotched points with a convex base are much larger than the Cottonwood or Plains. These could be from an earlier period or could be knives or preforms.

UTILIZED FLAKE

A utilized flake is a thinning flake that has some fine retouch work done on the ends and sometimes also on the side. This type of flake needs no modification, and when dull it can be resharpened.

WEIGHT

These weights vary in thickness from 13 mm to 25 mm. There is a notch on two opposing sides. Their exact purpose is unknown. Possible uses are as snare weights, anchors for tying down skins on lodges, fishnet weights, etc.

APPENDIX THREE
LATE PLAINS ARCHAIC PERIOD
DATED CA. 1500 B.P. TO 3000 B.P.

The following tables provide the developed statistics for this period (Tables 7, 8). The data within the tables are presented in alphabetical order based on type.

DESCRIPTIONS OF ARTIFACT TYPES USED IN THE LATE PLAINS ARCHAIC PERIOD, DATED CA. 1500 B.P. TO 3000 B.P.

CORNER TANG

A corner tang is a biface knife with a rounded base and sharp point. It was sharpened by means of a steep bevel on one side along one blade edge. As a result, one face remained nearly flat because all resharpening was done on one side. After a tool of this nature was sharpened beyond a certain point it was no longer functional and was discarded. During the Late Plains Archaic, notches were sometimes added to this tool, usually on the corner opposite the working edge, forming what is usually called a cornertang. The notches were placed there for better and easier tying of the knife to a handle. Dated ca. 1500 B.P. to 3000 B.P.

CORNER-NOTCHED WITH CONCAVE BASE

ELKO EARED/ELKO SPLIT STEM These

ARTIFACT TYPE	RETOUCH PERCENT	BASAL GRIND PERCENT	AVG. LENGTH (MM)	AVG. WIDTH (MM)	COMPLETE	PERCENT	TOTAL
Corner tang	80	0	60	40	3	1	5
Cornernotch w/concave base *	38	0	29	20	24	8	58
Cornernotch w/expanding base *	49	0	30	20	177	48	357
Drill w/expanding base *	57	0	37	22	12	3	21
Drill w/oval base *	19	0	34	25	7	2	16
Drill w/square base *	57	0	35	21	9	2	14
Fire drill *	56	0	29	22	6	1	9
Graver *	29	0	37	25	16	2	17
Sidenotch w/concave base *	50	1	29	17	132	33	244
TOTAL			30	19	386		741

* Artifact can be from several different time periods.

Table 7: Late Plains Archaic Period artifact type descriptions, from the Bozovich family collection.

Elko projectile points are triangular with straight to gently convex blade edges which are occasionally serrated. The base is always concave with deep forming corner-notches. Dated ca. 3000 B.P. to historic times.

GLENDO POINT The distinguishing feature of this type is the corner-notching, which varies from quite shallow and broad to form a slightly expanded stem and a hooked shoulder, to a fine deep notch which forms an expanded stem with pronounced barbs. A notched base is quite often found on this particular type of

MATERIAL TYPE	PERCENT	TOTAL
Chalcedony	6	45
Chert	65	478
Fine quartzite	8	60
Jasper	10	71
Moss agate	3	21
Obsidian	4	29
Oolitic chert	4	26
Petrified wood	1	11
TOTAL		741

FLAKING PATTERN	PERCENT	TOTAL
Collateral	0	2
No chipping	0	1
Oblique	0	1
Random	66	486
Transverse	34	251
TOTAL		741

MATERIAL COLOR	PERCENT	TOTAL
Black	9	66
Brown	32	234
Clear	0	1
Cream	0	2
Gray	21	153
Green	0	2
Orange	6	48
Pink	1	11
Purple	0	2
Red	3	19
Tan	20	148
White	7	55
TOTAL		741

PART MISSING	PERCENT	TOTAL
Complete artifact	52	386
Base	1	4
Corner of base	1	9
Ear	5	36
Side	0	1
Tip	39	292
Tip and base	1	5
Tip and ear	1	8
TOTAL		741

Table 8: Late Plains Archaic Period artifact descriptions, by material type, material color, flaking pattern, and part missing, from the Bozovich family collection.

artifact. Some polish is noted in the notch. Dated ca. 1000 B.C. to 2000 B.C.

CORNER-NOTCHED WITH EXPANDING BASE

ELKO CORNER-NOTCHED The Elko Corner-notched are triangular-shaped, medium-sized projectile points which tend to be well made. The blade edges range from straight to gently convex, while the expanding stem is always narrower than the blade. The base is generally straight or slightly convex. Often the Elko corner-notched points appear to be identical to the Glendo points. Dated ca. from 3000 B.P. to historic times.

PELICAN LAKE POINT Pelican Lake points have diagonal flaking and are acute shouldered with convex or straight body edges. Bases are narrower than the body. Flaking is fine and diagonal. Some basal polish is noted in the notches. Pelican Lake points look somewhat like the Elko points. Dated ca. 2500 B.C.

DRILL

Drills are bifacially reduced artifacts with long, thin distal ends that have been flaked laterally to produce a nearly circular or thick, biconvex cross section, as opposed to thinned edges. The drill was used for making holes in the sewing of garments for wear and very possibly for other uses. Dated Late Prehistoric times to present.

DRILL WITH EXPANDING BASE This drill type has an expanding base. Dated prehistoric times to present.

DRILL WITH OVAL BASE This drill type has an oval base. Some polish is noted from hafting wear. Dated prehistoric times to present.

DRILL WITH SQUARE BASE This type of drill is harder to fasten to a shaft, but could be fastened by using pitch or other methods. It is possible that some of these drills are actually of Paleo origin.

GRAVER

The graver is a stone implement generally made by pressure flaking and intentionally designed to have a functional point or points. It is generally assumed that gravers are used to incise or form organic materials and soft stone. Most archaeologists believe that the graver was used to incise bones to make them split in the correct place when trying to get to the bone marrow. Dated prehistoric times to the present.

GRAVER/FIRE DRILL This stone implement was very likely used as a graver to carve lines into bone, and probably used as a tool in the making of a fire. The stone tool was fastened on an arrow shaft which was rolled between the palms of the hands to create friction at the point. By having some dried leaves or other dried material at the point, a fire could be started. Dated prehistoric times to present.

SIDE-NOTCHED WITH CONCAVE BASE

ELKO EARED/ELKO SPLIT STEM These are triangular projectile points with straight to gently convex blade edges. The stem is always expanding, while the base is always concave. Dated ca. 3000 B.P. to historic times.

HANNA Hanna points are small to medium size dart points characterized by a straight, converging, and incurving blade and straight, thinned base. The base is notched or thinned. Hanna points are named for a site in Wyoming. The length averages 25 mm or more. Dated ca. 2500 B.C. to 850 B.C. **[EDITOR'S NOTE:** Hanna and Mallory points are normally considered Middle Plains Archaic in age].

MALLORY POINTS Mallory points are wide and very thin, with deep side-notches placed well forward, and a base that is either straight, slightly concave or deeply indented. This point belongs with the McKean complex and probably represents a different hafting procedure. Dated ca. 3000 B.P. **[EDITOR'S NOTE:** Hanna and Mallory points are normally considered Middle Plains Archaic in age].

OXBOW The Oxbow point resembles the McKean and Duncan, with the same type of expanding stem. It is basally thinned, with a broad incurved base, shallow side-notches, and rounded lugs. One can only speculate that there

was a slow transition in the chipping style of these different points. They were probably attached to a large shaft or spear. Dated ca. 5200 B.P. to 3000 B.P.

APPENDIX FOUR
MIDDLE PLAINS ARCHAIC PERIOD
DATED CA. 3000 B.P. TO 5000 B.P.

The following tables provide the developed statistics for this period (Tables 9, 10). The data within the tables are presented in alphabetical order based on type.

DESCRIPTIONS OF ARTIFACT TYPES USED IN THE MIDDLE PLAINS ARCHAIC PERIOD, DATED CA. 3000 B.P. TO 5000 B.P.

ALTITHERMAL KNIFE

Altithermal knives are quite large, used in the butchering of any kind of animal. A study on Altithermal knives was done by Western Wyoming Community College. The college borrowed some of the knives in this collection for their study. In 1983, work was done on the Deadman Wash site. A number of Altithermal knife specimens were found in this site. Most of the specimens are quite large, averaging 64 mm in length, 32 mm in width, 6 mm in thickness, 15 mm in stem length, 20 mm in neck width and 30 mm in base width. This size range would preclude their use as dart points but not as spear points. The contention of the study is that these large artifacts functioned as hafted knives. All examples show evidence of extensive blade sharpening. Blade edge angles are 55-70 degrees. Hafting wear is evident in the notches of all specimens indicating a prolonged application of lateral force that would be expected in a cutting tool. Dated ca. 6800 B.P. to 4000 B.P. **[EDITOR'S NOTE:** The "Altithermal Knife" is normally considered Early Plains Archaic in age].

CORNER-NOTCHED WITH CONVEX BASE

ELKO CORNER-NOTCHED These well-made projectile points are triangular and medium-sized. The blade edges range from straight to gently convex, while the expanding stem is always narrower than the blade. The degree of stem expansion varies greatly from one specimen to another. The base is generally straight or slightly convex. Some polish but no grinding was noted. Dated ca. 3000 B.P. to historic times.

ARTIFACT TYPE	RETOUCH PERCENT	BASAL GRIND PERCENT	AVG. LENGTH (MM)	AVG. WIDTH (MM)	COM-PLETE	PERCENT	TOTAL
Altithermal knife *	73	27	61	33	3	3	11
Cornernotch w/convex base *	34	0	33	22	49	21	91
Drill w/concave base *	60	0	34	21	2	1	5
Duncan	34	16	37	22	66	41	177
McKean	56	4	38	20	20	11	48
Sidenotch w/expanding base *	32	1	30	19	40	16	71
Square base *	44	3	33	20	13	7	32
TOTAL			35	21	193		435

* Artifact can be from several different time periods.

Table 9: Middle Plains Archaic artifact type descriptions, from the Bozovich family collection.

MATERIAL TYPE

	PERCENT	TOTAL
Chalcedony	6	24
Chert	52	226
Fine quartzite	25	109
Jasper	5	23
Moss agate	2	10
Obsidian	2	10
Oolitic chert	3	15
Petrified wood	4	17
Sandstone	0	1
TOTAL		435

FLAKING PATTERN

	PERCENT	TOTAL
Collateral	1	6
No chipping	0	1
Oblique	1	6
Random	68	296
Transverse	29	126
TOTAL		435

MATERIAL COLOR

	PERCENT	TOTAL
Black	5	23
Brown	27	119
Cream	1	3
Gray	21	91
Green	1	3
Orange	5	23
Pink	2	10
Red	1	4
Tan	19	82
White	18	77
TOTAL		435

PART MISSING

	PERCENT	TOTAL
Complete artifact	44	193
Base	1	5
Corner of base	1	4
Ear	2	7
Side	0	2
Tip	50	217
Tip and base	1	4
Tip and ear	0	2
Tip and side	0	1
TOTAL		435

Table 10: Middle Plains Archaic artifact descriptions, by material type, material color, flaking pattern, and part missing, from the Bozovich family collection.

DRILL WITH CONCAVE BASE

It is possible that some drills with a concave base are projectile points that were resharpened a number of times and then converted into a drill.

SIDE-NOTCHED WITH EXPANDING BASE

DUNCAN Duncan points have a lenticular cross-section with a straight converging or bilaterally convex blade. The stem is straight, parallel-sided or slightly expanding with a shallowly notched base. The base is notched by pressure chipping on both faces from the base towards the tip and is insloping and non-barbed. Dated ca. 1450 B.C.

HANNA Hanna points are small to medium sized dart points characterized by a straight, converging and incurving blade, and a straight, thinned base. Hanna points appear to be contemporaneous with Duncan points. No grinding was noted. Dated ca. 2500 B.C. to 850 B.C.

MCKEAN McKeans are small leaf-shaped points with pressure flaking on both faces and a lenticular cross-section. The base is thinned and either concave or convex. The blade is lanceolate and is slightly narrower at the base than toward the middle. Some basal edge polish was noted. Dated ca. 2500 B.C.

SQUARE BASE

These artifacts have a square base but do not show signs of being Paleoindian in origin.

APPENDIX FIVE
EARLY PLAINS ARCHAIC PERIOD
DATED CA. 5000 B.P. TO 8000 B.P.

The following tables provide the developed statistics for this period (Tables 11, 12). The data within the tables are presented in alphabetical order based on type.

DESCRIPTIONS OF ARTIFACT TYPES USED IN THE EARLY PLAINS ARCHAIC PERIOD DATED CA. 5000 B.P. TO 8000 B.P.

HAFTED SCRAPER

Hafted scrapers are made with a notch on each side at about the midway point. The notch was made in this way for ease in the fastening of a handle or shaft. With this arrangement greater pressure could be applied.

LOVELL CONSTRICTED

These points are lanceolate shaped with crude parallel oblique flaking. Slightly restricted blade edges give a vaguely stemmed appearance. Bases are concave. Dated ca. 6200 B.C.

SIDE-NOTCHED WITH CONVEX BASE

ROCKER SIDE-NOTCHED These artifacts have wide lanceolate blades with moderately high horizontal side-notches forming a stem that approaches semicircular in shape. The edges both above and below the notches form a continuous, smooth curve broken only by the notches. Dated ca. 6800 B.P. to 5900 B.P.

ARTIFACT TYPE	RETOUCH PERCENT	BASAL GRIND PERCENT	AVG. LENGTH (MM)	AVG. WIDTH (MM)	COMPLETE	PERCENT	TOTAL
Hafted scraper *	40	4	38	33	22	15	25
Lovell constricted *	100	88	48	22	9	10	17
Sidenotch w/convex base *	21	2	35	19	84	75	126
TOTAL			37	22	115		168

* Artifact can be from several different time periods.

Table 11: Early Plains Archaic artifact type descriptions, from the Bozovich family collection.

MATERIAL TYPE	PERCENT	TOTAL
Chalcedony	5	8
Chert	61	103
Fine quartzite	11	19
Jasper	7	12
Moss agate	3	5
Obsidian	4	7
Oolitic chert	6	10
Petrified wood	2	4
TOTAL		168

MATERIAL COLOR	PERCENT	TOTAL
Black	10	17
Brown	23	39
Cream	1	2
Gray	30	50
Green	1	1
Orange	5	8
Pink	2	4
Red	2	4
Tan	20	34
White	5	9
TOTAL		168

PART MISSING	PERCENT	TOTAL
Complete artifact	68	115
Base	1	1
Ear	1	1
Side of artifact	1	2
Tip	29	49
TOTAL		168

FLAKING PATTERN	PERCENT	TOTAL
Oblique	4	6
Random	75	126
Transverse	21	36
TOTAL		168

Table 12: Early Plains Archaic Period artifact type descriptions, by material type, material color, flaking pattern, and part missing, from the Bozovich family collection.

APPENDIX SIX
PALEOINDIAN PERIOD
DATED CA. 8000 B.P. TO 12,000 B.P.

The following tables provide the developed statistics for this period (Tables 13, 14). The data within the tables are presented in alphabetical order based on type.

DESCRIPTIONS OF ARTIFACT TYPES USED IN THE PALEOINDIAN PERIOD DATED CA. 8000 B.P. TO 12,000 B.P.

AGATE BASIN

Agate Basin projectile points are a long slender point with a straight or convex base. There is grinding of the lower lateral edges but rarely of the base. The sides are parallel or slightly convex. Maximum breadth is generally above the midpoint. Dated ca. 10,300 B.P.

ALBERTA

The Alberta is a very large and broad lanceolate stemmed point with faint to prominent shoulders. The stem is straight and ground. The widest point is at the shoulder. It has irregular and transverse parallel percussion flaking with pressure retouch, and a lenticular cross section. Alberta points are commonly found in association with Cody Complex and sometimes included in the group. The shape is similar to Scottsbluff but larger and longer with convex base and more pronounced shoulders.

ANGOSTURA

These have parallel flake scars generally running diagonally from upper left to lower right (sometimes horizontally). The point is thin, slender, long, and lanceolate in shape. The base shows basal thinning and grinding. Dated ca. 9000 to 10,000 B.P.

ARTIFACT TYPE	RETOUCH PERCENT	BASAL GRIND PERCENT	AVG. LENGTH (MM)	AVG. WIDTH (MM)	COMPLETE	PERCENT	TOTAL
Agate Basin	100	70	39	20	9	22	46
Alberta	100	100	55	25	2	1	3
Angostura	100	100	37	16	1	1	3
Channel flake	50	100	26	14	6	3	6
Clovis	83	100	37	26	1	3	6
Cody knife	100	100	52	25	3	2	5
Concave base *	81	67	42	21	7	10	21
Convex base *	100	33	88	30	3	1	3
Cornernotch *	83	17	63	30	2	3	6
Drill *	100	100	31	20	2	1	3
Eden	92	69	50	18	7	6	13
Folsom	100	63	21	19	0	4	8
Graver *	100	100	39	24	6	3	6
Grinding stone	100	100	34	26	1	0	1
Hell Gap	100	100	43	26	2	6	13
Jimmy Allen	67	33	44	22	0	1	3
Lanceolate *	80	40	53	21	1	2	5
Scottsbluff	88	75	54	30	2	4	8
Scraper *	79	100	48	32	19	9	19
Sidenotch *	100	29	54	20	6	3	7
Square base *	96	83	43	18	4	11	23
TOTAL			44	22	84		208

* Artifact can be from several different time periods.

Table 13: Paleoindian artifact descriptions, from the Bozovich family collection.

MATERIAL TYPE	PERCENT	TOTAL
Chalcedony	3	7
Chert	73	152
Fine quartzite	7	14
Jasper	13	26
Obsidian	1	2
Oolitic chert	3	7
TOTAL		208

MATERIAL COLOR	PERCENT	TOTAL
Black	6	12
Brown	27	57
Gray	25	51
Green	1	3
Orange	5	11
Pink	1	3
Red	4	8
Tan	28	58
White	2	5
TOTAL		208

FLAKING PATTERN	PERCENT	TOTAL
Bi-bevel	0	1
Collateral	4	8
No chipping	2	4
Oblique	3	7
Random	25	53
Transverse	65	135
TOTAL		208

PART MISSING	PERCENT	TOTAL
Complete artifact	40	84
Base	6	12
Corner of base	0	1
Ear	0	1
Tip	43	90
Tip and base	9	19
Tip and ear	0	1
TOTAL		208

Table 14: Paleoindian artifact descriptions, by material type, material color, flaking pattern, and missing parts, from the Bozovich family collection.

CHANNEL FLAKE

These flakes result from the projectile point fluting process and are known as channel flakes. They are generally parallel sided, flat in longitudinal section, slightly plano-convex in lateral cross section, and have a well-prepared, isolated, ground platform. Dated ca. 10,700 B.P.

CLOVIS

The Clovis point is a fluted lanceolate point that is larger in size than the Folsom point, less skillfully made, and the flutes are shorter in length. The base and sides of the base are ground as in the Folsom point. The concave base is more shallow and the point tapered rather than rounded. The sides are parallel or slightly convex. The concave base is often "V" shaped with basal edge grinding to about one-third of the length. The flutes extend from one-third to one-half in length, longer on one side than the other. Dated ca. 11,300 to 15,000 B.P.

CODY KNIFE

Cody knives are usually shouldered on one edge only, although occasionally double-shouldered stemmed knives with offset tip to one lateral side are found. Thus, one side tends to be nearly vertical with the opposite side parallel to the shoulder where the edge runs diagonal to the opposite lateral edge. Dated ca. 6900 B.P.

CONCAVE BASE

These Paleoindian artifacts have a concave base.

CONVEX BASE

These Paleoindian artifacts have a convex base.

CORNER-NOTCHED

These Paleoindian artifacts have corner-notches.

DRILL

The drill is a bifacially reduced artifact with long thin distal ends that have been flaked laterally to produce a nearly circular or thick, biconvex cross section. In this category the drills all have grinding on the base, which those in other periods do not have. Dated ca. 8000 to 12,000 B.P.

EDEN

There are two types of flaking for Eden points. Collateral flaking has a diamond-shaped

cross section with median ridges present. Transverse flaking has an oval cross section with parallel median ridges less clearly marked. Stem inserts are very slight. Dated ca. 7000 to 9000 B.P.

FOLSOM

Folsom projectile points are finely pressure-flaked into a thin leaf shape with an average length of two inches. The base is concave, with ear-like projections. Often there is a small central nipple in the basal concavity. A longitudinal channel flake is usually removed from each face. Dated ca. 10,700 B.P.

GRAVER

The Paleoindian gravers are like an end-scraper, but with a spur on the end or corner. One of the gravers in this collection has three spurs, one on each corner and one in the center. Sometimes there is only one spur in the center. They are usually made on a medium-sized flake. Dated ca. 8000 to 12,000 B.P.

GRINDING STONE

Grinding stones were used to provide basal grinding to the edges of artifacts, presumably to prevent damage to sinew used to tie an artifact to a spear or atlatl. The grinding stone in this collection is made from fine quartzite and has scratch marks indicating use as a grinding stone. It was found in a site with Agate Basin points.

HELL GAP

Hell Gap points have a constricted, stemmed base flaring out into a general lanceolate form. The base is straight or slightly convex; rarely concave. The cross-section is a narrow oval to almost diamond shape. The method of manufacture is percussion flaking with pronounced basal grinding on stem. Dated ca. 10,000 B.P.

JIMMY ALLEN

Jimmy Allen points are moderately long, more or less parallel sided, and characterized by oblique, parallel flaking. Bases are unstemmed, concave, have rounded corners and are indented about a quarter of the basal width. A third of the blade has grinding. Dated ca. 7900 B.P.

LANCEOLATE

These Paleoindian artifacts have a lanceolate shape.

SCOTTSBLUFF

The are two major sub-types of Scottsbluff points. Type I has a thick oval cross-section, small shoulders and a broad stem which is usually ground. It is can be somewhat triangular or parallel-sided. Flaking is usually transverse parallel type but may be more irregular. Type II is like Type I but the cross-section is thin and lenticular with more clearly defined shoulders and wider triangular blades. Dated ca. 7000 to 9000 B.P.

SCRAPER

The endscrapers in this category are Folsom type scrapers with a small spur or burin on each corner of the working end. This is typical of all or most of the Folsom type endscrapers.

SIDE-NOTCHED

These Paleoindian artifacts have side-notches.

SQUARE BASE

These Paleoindian artifacts have a square base. It is not clear that these are Cody complex artifacts.

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1995 ARCHAEOLOGY WEEK POSTER

Wyoming Archaeology Week was recently awarded third place in the 1996 Archaeology Week Poster Contest sponsored by the Society for American Archaeology's Public Education Committee and Council of Affiliated Societies at the 61st Annual Meeting of the Society for American Archaeology in New Orleans, Louisiana. The top three poster winners were chosen through a ballot voting by the membership.

The 1995 Wyoming Archaeology Week poster was truly a grassroots project. The mural was provided by the Green River Valley Museum in Big Piney, Wyoming and painted by local Wyoming artists Lynn Thomas, Charmain McLellan, Ruth Rawhouser, Betty Pfaff, Tib Sutherland, Ann Anspach, and Mary Krause. The mural is based on excavations of the Wardell Bison Trap by the University of Wyoming Department of Anthropology in southwestern Wyoming. The photo was taken by Richard Collier, State Historic Preservation Office and the graphics were done by Kirsten Keeton, Graphic Arts, University of Wyoming. Barbara McKinley of the Green River Valley Museum provided support and coordination. The project is coordinated by the Cultural Records Office of the Wyoming State Historic Preservation Office.

Wyoming Archaeology Week was funded by a grant from the Wyoming Council for the Humanities and from many other private and federal agencies. They include the Wyoming State Historic Preservation Office, Office of the Wyoming State Archaeologist, the Wyoming State Museum, the Bureau of Land Management, the U.S. Forest Service, the U.S. Bureau of Reclamation, the Wyoming Association of Professional Archaeologists, the Wyoming Archaeological Society, the University of Wyoming Anthropology Department, the Wyoming Department of Transportation, the Friends of the Washakie County Museum, the Green River Valley Museum, F.E. Warren Air Force Base, and the National Park Service.

PREHISTORIC OBSIDIAN UTILIZATION IN THE BEARTOOTH MOUNTAINS OF MONTANA AND WYOMING

by

Raymond Kunselman and Wilfred M. Husted

ABSTRACT

X-ray fluorescence spectroscopy was used to determine the source of 107 obsidian projectile points in surface collections from the Beartooth Mountains of south-central Montana and northwest Wyoming. Seventy-two percent of the points were from Obsidian Cliff in Yellowstone National Park, Wyoming. Evidence was found for change of source usage when the artifacts were grouped into cultural affiliation periods.

INTRODUCTION

Several hundred artifacts from three well-documented surface collections from the Beartooth Mountains of south-central Montana and northwest Wyoming were subjected to X-ray fluorescence (XRF) to determine the sources of the obsidian used to make the artifacts (Figure 1). Most of these specimens are from the Vernon Waples Collection assembled from about 1950 to 1970 when the Beartooth Mountains were extensively denuded by the grazing of sheep. Another 56 specimens are from the Howard Thom and Family Collection. The Beartooth Alpine Archaeological Project (BAAP) contributed several artifacts from the Shoshone and Custer National Forests.

The study of obsidian use in prehistoric economies is assisted by the physical characterization of source materials. X-ray fluorescence was used to determine trace element content as a signature of source for artifact obsidian. The pattern of sources used in a region provides information concerning the acquisition and distribution of obsidian such as indirect acquisition by trade and exchange or direct acquisition during seasonal migrations or special trips.

The most important potential sources of obsidian close to the Beartooth Mountains are Yellowstone National Park and the volcanic fields to the west and southwest along the Snake River Plain (Pierce et al. 1992). A source has a unique chemistry because of the differences in the underlying geology of the region. The data allowed us to connect each artifact by the chemical signature to the obsidian geological source.

METHODOLOGY

Discussions of measurement uncertainties or errors, matrix effects, and differences between thick and thin samples are presented by Giaque (1993) and Kunselman (1991). The effects of such uncertainties are included in the estimates with our data. The analysis procedure used for the artifacts was non-destructive. The apparatus and procedure were used to analyze both large artifacts and small flakes because they all contain chemical source information. The XRF procedure was reliable and simple to avoid false identifications that would lead to wrong statements about behaviors. The analyses at UW produced data on trace elements of the source material, artifacts, and calibration materials using energy dispersion (Kunselman 1991, 1994). We also reanalyzed seven points with

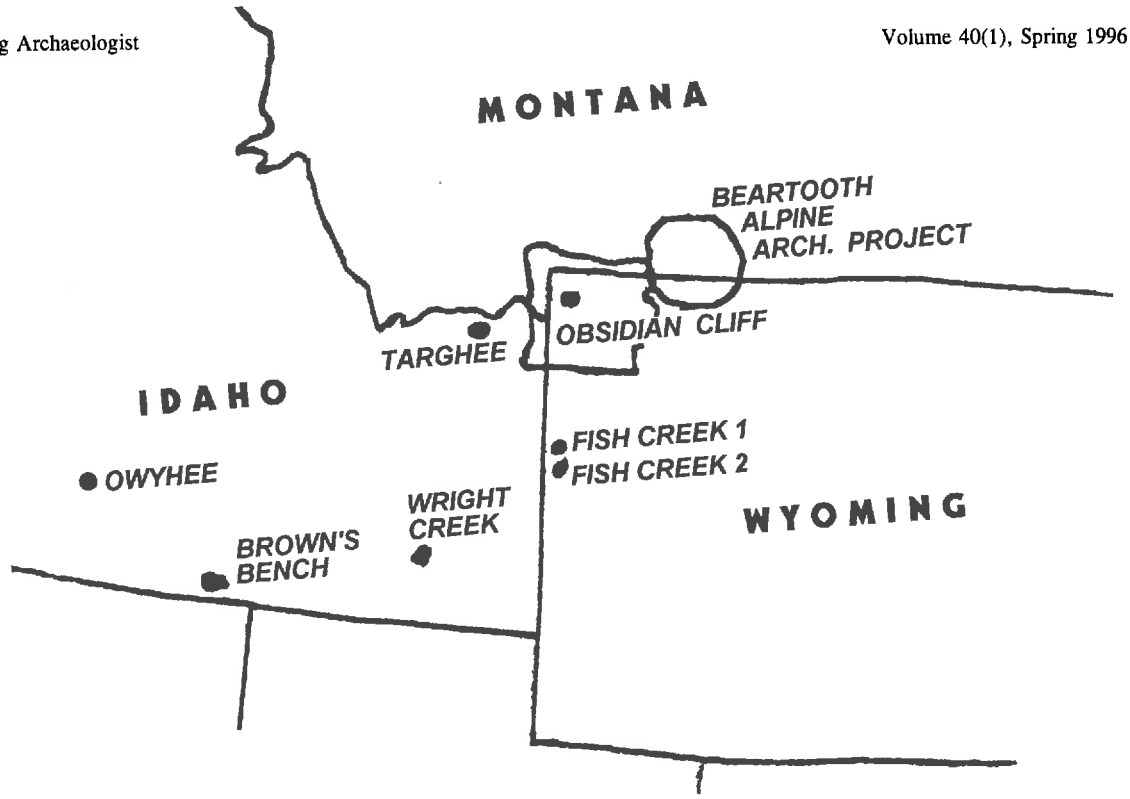

Figure 1: Regional map showing source locations of BAAP obsidian artifacts. General region is mountains enclosed by the Yellowstone River and Clarks Fork River in the Custer and Shoshone National Forests of Montana and Wyoming.

wavelength dispersion to confirm the chemical signatures.

The diagnostic elements were rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), and iron (Fe). The error for a single measurement of an element of a source sample is sometimes a smaller value than the standard deviation for an element of a set of source samples. That is, there can be significant source variation of the part per million (ppm) of some elements. The match of an artifact to a set of source samples requires each element to fall within a two standard deviation range. A matching of artifacts to sources by a multivariate procedure chooses a best match but is not appropriate unless the complete set of the source universe is available (Nelson 1975; Hughes 1984).

RESULTS

Of the 377 obsidian artifacts studied, 107 are classifiable projectile points. These were identified and grouped chronologically following Frison (1991:Figure 2.4). Raw data results are presented in Appendix A and graphically (Figure 2). Intermittent occupancy of the Beartooth Mountains for the last 10,000 years is indicated.

The XRF data for the artifacts are summarized (Table 1). The main source of obsidian in the Beartooth Mountains collections was Obsidian Cliff in Yellowstone National Park, Wyoming (72%). Other sources are Bear Gulch in Targhee National Forest, Idaho (15%) and Wright Creek near Malad, Idaho (6%). One percent of the points are assigned to three sources: Fish Creek second variety (variety 2) near Wilson, Wyoming, Owyhee near Oreana, Idaho, and Browns Bench near Three Creek, Idaho. Five projectile points were made on obsidian from

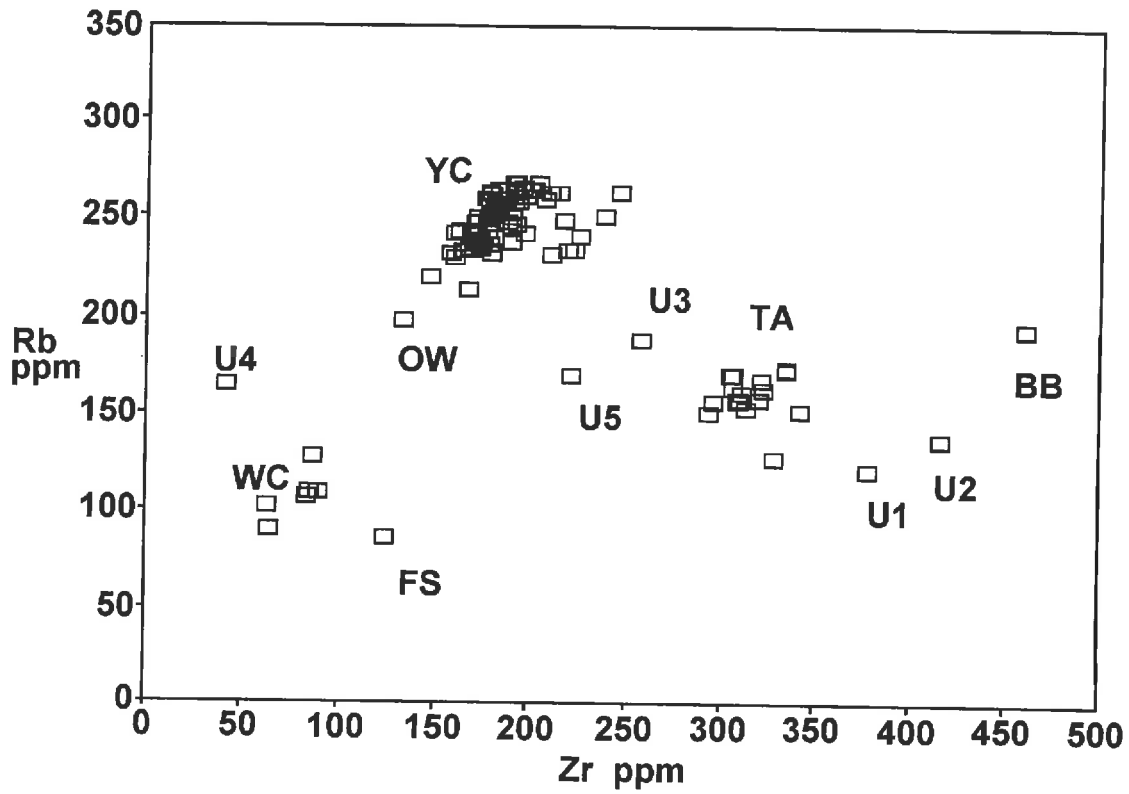

Figure 2: Bivariate plot of RB and ZR ppm for projectile point artifacts from BAAP. Note clustering of artifact signatures into source groups.

probably three presently unidentified sources. A search of pertinent literature failed to reveal source matches (Nelson 1984). Because the specimens were unaffected by the non-destructive analysis, we have the option of conducting further XRF analyses in the future.

The source data for the total obsidian assemblage of 377 items, including flakes, is similar to the projectile points. The fractions are 79% for Obsidian Cliff, 9% for Bear Gulch, 3% for Wright Creek, 1% for the Fish Creek sources, and 3% for all other sources. Southern Jackson Hole includes two chemically distinct varieties of obsidian Fish Creek variety 1 (FC), and Fish Creek variety 2 (FS), with a sometimes used alias of Teton Pass instead of Fish Creek. One projectile point is FS, one flake is FS, and one flake is FC.

DISCUSSION

The purpose of the present paper was obsidian source use to study prehistoric cultural behavior and change (Dixon 1968; Renfrew 1977). After measuring the composition of the obsidian artifacts and determining the likely source of the material, we were able to speculate and interpret behavior. A fundamental question was why the prehistoric people had the connections and contacts that the obsidian sourcing indicated. The patterns allow us to speculate and build models for explanation of the obsidian use. These speculations and models can be

CULTURAL AFFILIATION	CHEMICAL SOURCE							
	YC	TA	FS	WC	BB	OW	U	Total
Late Paleo 9000 bp - 8000 bp	2	0	0	0	0	0	1	3
Early Archaic 7800 bp - 5000 bp	9	1	0	1	0	0	0	11
Middle Archaic 5000 bp - 3000 bp	10	0	0	0	1	0	1	12
Late Archaic 3000 bp - 1500 bp	24	3	1	2	0	1	1	32
Late Prehistoric 1500 bp - historic	32	12	0	3	0	0	2	49
TOTAL	77	16	1	6	1	1	5	107

KEY: YC = Obsidian Cliff, Yellowstone National Park, WY; TA = Bear Gulch, Targhee National Forest, ID; FS = Fish Creek, second variety, Jackson Hole, WY; WC = Wright Creek, Malad, ID; BB = Browns Bench, ID; OW Owyhee, ID; U = unknown or unassignable source

Table 1: Sources for Beartooth Mountains obsidian artifacts as a function of cultural affiliation.

compared to other data for testing of the patterns.

One would expect that the source material used would mainly be from the nearest source and that material usage would decrease with distance. The first point to note is that the amount of source use as a function of distance from the center of the Beartooth area to the sources is not uniformly decreasing. The use does not fall off inversely with distance. Obsidian Cliff is closest (about 90 km) and provided most of the material, with Bear Gulch the third closest (180 km) and second most used source. The Jackson Hole source Fish Creek variety 2, (FS), is closer (150 km) and used less than the Bear Gulch source in Targhee National Forest. The FS obsidian was also used less than the more distant (380 km) Wright Creek source (Figure 1). There may have been a prohibition or barrier that resulted in the lack of artifacts from the Fish Creek sources of good quality obsidian in Jackson Hole. The number of points involved is small but the effect is definite. The same result of a lesser usage of Jackson Hole sources and greater use of Targhee sources was reported for the data from the nearby Lookingbill Site 120 km east of southern Jackson Hole (Kunselman 1994).

A second point concerns a relationship between the particular sources used and time period. Because of the small numbers of artifacts involved, the data were regrouped from into two time periods of early prehistoric, EP, [including Paleoindian (PI), Early Plains Archaic (EA), Middle Plains Archaic (MA), and Late Plains Archaic (LA)], and Late Prehistoric, (LP). These data (Table 2) show the relative amounts of Targhee and Yellowstone source material changed from nine to 37%, a factor of almost 4. The amounts from Fish Creek being smaller compared to Targhee and Wright Creek persists and remains inverse to expectations for both time periods considering the distances from the BAAP (Table 1).

We can offer no compelling reason for the patterns of sources used. The patterns may have a simple explanation: a change in control by a group, or a culturally perceived barrier. The adoption of the horse might be part of an explanation for the increased use of the Targhee source compared to the Obsidian Cliff source for the Late Prehistoric period. Speculations for the patterns and change could be a change from utilitarian to ritual material usage. As a generally common lithic material, obsidian served utilitarian purposes, and as an uncommon material served prestige or ceremonial purposes (Torrence 1986; Jennings 1989). High altitude adaptations are in locations that are part of connections between peoples of the region. We can only speculate on the lack of use of Jackson Hole obsidian at present.

A future goal is to distinguish whether the obsidian artifacts represent logistical organization of trade and exchange, collection as part of specific collecting trips, or imbedded behavior as collection during migrations. We do not have sufficient data to do a great deal of speculation. Only a few flakes of Fish Creek obsidian were found in the Beartooth collections. Obsidian

CULTURAL AFFILIATION	CHEMICAL SOURCE			
	YC	TA	Other	Total
Early Prehistoric				
9000 bp - 1500 bp	42	4	8	54
Late Prehistoric				
1500 bp - historic	30	11	5	46
TOTAL	72	15	13	100

KEY: YC = Obsidian Cliff, Yellowstone National Park, WY; TA = Bear Gulch, Targhee National Forest, ID; Other includes FS = Fish Creek, variety 2, Jackson Hole, WY; WC = Wright Creek, Malad, ID; BB = Browns Bench, ID; OW = Owyhee, ID; and unknown or unassignable source

Table 2: Sources for Beartooth Mountains obsidian artifacts as a function of regrouped cultural affiliations. Relative amounts of 107 projectile points are listed as percentages.

sources used at other sites within the region are being studied to establish and explain patterns and change in order to understand and explain connections and contacts.

CONCLUSIONS

XRF contributed to a study of prehistoric connections to the Beartooth Mountains by providing definite evidence of obsidian sources that were used or not used. The evidence for obsidian use did not decrease smoothly with distance between the central area of the Beartooth Mountains and the sources. The source preference changed with time.

The prehistoric people in the Beartooth Mountains of Montana and Wyoming were mobile and apparently had connections at reasonably great distances. The presence and absence of some sources does prove some connections and lack of connections. The absence of sources in other directions where obsidian sources do not exist requires other evidence. The limited use of existing sources is an indication of possible barriers or preferences. We will be able to speculate better about this with more data. The determination of why prehistoric peoples crossed some barriers rather than other barriers will need more of this kind of data from several sites, and the present work contributes to such a comprehensive study.

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Appendix A: Data produced from the XRF analyses: chemical source, trace element chemical composition, artifact identification of XRF reference number and field number, and cultural affiliation. The keys to source labels are given below. The measurement uncertainties of each element are about 5% for Rb, Sr, and Fe, 7% for Y and Zr, and 9% for Nb. In four selected cases the data for the wave-length dispersion method is listed on a separate line for comparison.

	CHEMICAL SOURCE	CHEMICAL COMPOSITION (PPM)						ARTIFACT ID			CULTURAL AFFILIATION
		Rb	Sr	Y	Zr	Nb	Fe	D#	R#	F#	
OBSIDIAN CLIFF, YELLOWSTONE NATIONAL PARK, WYOMING											
1	YC	260	0	60	178	50	6672	28	.3	3	PI
2	YC	268	0	59	192	51	7457	31	.27	212	PI
3	YC	247	0	87	178	46	9063	87	.27	4.7	EA
4	YC	254	0	82	184	54	8061	31	.19	201	EA
5	YC	244	4	66	164	67	8455	31	.35	240	EA
6	YC	251	0	77	240	65	9841	29	.33	135	EA
7	YC	236	0	71	172	55	7872	28	.18	28	EA
8	YC	263	0	88	210	58	8998	31	.20	202	EA
9	YC	236	0	80	179	60	9302	87	.7	6.27	EA
10	YC	230	0	82	162	53	8809	103	.3	2	EA
11	YC	260	0	65	186	47	8083	28	.9	10	EA
12	YC	241	0	53	228	65	8828	31	.18	196	MA
13	YC	243	0	68	178	49	8341	29	.34	137	MA
14	YC	257	0	69	192	57	7620	31	.10	171	MA
15	YC	247	4	61	178	32	8405	87	.32	1.57	MA
16	YC	263	0	80	193	59	8263	31	.34	238	MA
17	YC	264	0	78	202	56	8648	87	.24	10.27	MA
18	YC	250	0	85	191	44	9653	87	.3	6.32	MA
19	YC	238	0	73	176	51	8579	29	.22	122	MA
20	YC	250	0	72	178	47	8434	29	.1	92	MA
21	YC	259	0	78	194	53	7898	29	.23	123	MA
22	YC	239	0	76	172	46	9139	87	.35	3.9	LA
23	YC	261	0	67	194	56	8080	87	.31	3.7	LA
24	YC	234	0	63	224	65	9544	29	.6	97	LA
25	YC	243	0	79	199	53	8272	30	.7	165	LA
26	YC	265	0	83	196	55	9314	28	.14	22	LA
27	YC	233	0	77	172	44	8605	87	.8	7.27	LA
28	YC	262	5	81	181	44	8439	29	.7	99	LA
29	YC	249	7	82	173	60	8306	28	.11	18	LA

	CHEMICAL SOURCE	CHEMICAL COMPOSITION (PPM)						ARTIFACT ID			CULTURAL AFFILIATION
		Rb	Sr	Y	Zr	Nb	Fe	D#	R#	F#	
30	YC	246	7	80	192	55	8394	30	.8	166	LA
31	YC	232	0	82	212	53	9523	87	.33	1.55	LA
32	YC	260	0	95	198	54	9428	87	.17	4.7	LA
33	YC	263	3	94	215	63	8821	87	.28	4.7	LA
34	YC	238	0	68	174	54	8004	29	.5	96	LA
35	YC	242	0	63	170	53	8076	28	.31	88	LA
36	YC	264	0	162	248	188	9700	28	.29	82	LA
37	YC	264	0	73	179	46	8256	29	.13	111	LA
38	YC	235	0	74	220	61	9482	29	.14	112	LA
39	YC	235	0	69	168	51	8118	29	.24	124	LA
40	YC	234	0	64	174	54	7580	28	.22	68	LA
41	YC	264	0	66	193	57	8135	31	.29	221	LA
42	YC	263	0	59	193	49	7302	30	.1	140	LA
43	YC	249	0	156	219	176	9100	30	.6	163	LA
44	YC	256	0	60	179	51	7438	28	.20	62	LA
45	YC	242	0	67	162	55	8398	29	.25	125	LA
46	YC	259	0	74	188	56	8330	29	.10	105	LP
47	YC	240	0	69	181	60	7445	29	.8	100	LP
48	YC	264	0	76	200	56	7924	28	.16	25	LP
49	YC	257	0	67	181	46	8361	29	.2	93	LP
50	YC	246	0	79	193	59	8638	88	.11	3.7	LP
51	YC	220	0	65	149	50	8470	31	.31	223	LP
52	YC	251	0	70	181	52	8242	28	.26	74	LP
53	YC	243	0	60	171	49	8024	29	.29	129	LP
54	YC	213	5	84	168	55	8209	102	.26	223	LP
55	YC	244	2	79	173	55	8553	31	.36	241	LP
56	YC	259	7	68	179	51	8439	29	.20	120	LP
57	YC	235	6	81	169	35	18160	31	.14	185	LP
58	YC	232	0	73	159	48	7936	29	.26	126	LP
59	YC	240	0	63	175	43	8339	28	.21	67	LP
60	YC	264	2	67	184	58	8168	29	.31	133	LP
61	YC	257	1	72	184	50	8102	28	.25	73	LP
62	YC	256	0	67	179	47	8484	29	.18	117	LP
63	YC	259	0	89	209	56	7262	88	.17	8.39	LP
64	YC	234	0	72	167	50	8083	31	.25	210	LP
65	YC	268	0	66	194	50	7825	29	.17	116	LP
66	YC	252	0	65	179	42	8600	28	.1	1	LP
67	YC	254	0	77	183	56	8318	29	.16	115	LP
68	YC	265	0	78	189	46	8503	29	.3	94	LP
69	YC	268	0	76	204	51	8004	29	.4	95	LP
70	YC	247	0	64	189	45	7659	29	.15	113	LP
71	YC	238	0	72	171	54	7953	28	.15	23	LP
72	YC	251	0	60	173	51	7476	28	.23	69	LP
73	YC	237	0	74	191	52	8443	88	.23	6.21	LP
74	YC	250	0	64	179	48	8458	31	.16	188	LP
75	YC	232	0	74	181	48	8296	31	.15	186	LP
76	YC	235	0	77	174	54	8552	28	.13	21	LP
77	YC	233	0	83	166	46	8157	28	.12	20	LP
WRIGHT CREEK, NEAR MALAD, IDAHO											
78	WC	106	73	25	85	28	6109	31	.24	209	EA
79	WC	128	92	37	89	37	6551	87	.10	8.36	LA
80	WC	89	66	32	66	21	5190	88	.20	1.55	LA
81	WC	109	75	42	91	33	6717	30	.2	153	LP
82	WC	110	81	30	85	20	6256	29	.12	108	LP
83	WC	101	73	17	65	40	6046	88	.16	3.25	LP

CHEMICAL SOURCE		CHEMICAL COMPOSITION (PPM)						ARTIFACT ID			CULTURAL AFFILIATION
		Rb	Sr	Y	Zr	Nb	Fe	D#	R#	F#	
BEAR GULCH, TARGHEE NATIONAL FOREST, IDAHO											
84	TA	173	44	43	335	61	12079	102	.28	1	EA
85	TA	154	57	44	314	62	11462	87	.22	6.29	LA
86	TA	164	43	33	324	63	10543	28	.8	8	LA
87	TA	158	52	48	322	52	11589	87	.19	2.36	LA
88	TA	169	49	38	323	53	11486	31	.17	191	LP
89	TA	171	45	35	307	56	11266	28	.27	75	LP
90	TA	162	44	35	312	62	10872	31	.30	222	LP
91	TA	170	59	54	308	61	10993	88	.18	6.21	LP
92	TA	164	54	35	308	64	11771	102	.25	222	LP
93	TA	174	50	44	335	59	11207	28	.5	5	LP
94	TA	158	44	34	297	55	11226	29	.9	104	LP
95	TA	152	39	60	342	51	12278	87	.25	4.7	LP
96	TA	157	37	41	312	56	11092	29	.27	127	LP
97	TA	129	23	57	329	42	12846	88	.22	7.27	LP
98	TA	152	40	30	295	54	10848	29	.32	134	LP
99	TA	159	41	38	310	55	11463	28	.2	2	LP
FISH CREEK, SECOND VARIETY, NEAR WILSON, WYOMING											
100	FS	86	163	13	126	27	9390	31	.9	168	LA
BROWNS BENCH, NEAR THREE CREEK, IDAHO											
101	BB	196	48	51	461	39	14041	31	.23	208	MA
		203	49	66	465	38					
OWYHEE, NEAR OREANA IDAHO											
102	OW	197	47	21	135	16	7502	28	.28	81	LA
		192	46	25	127	6					
UNKNOWN OR UNASSIGNABLE SOURCES											
103	U1	122	7	44	379	28	11584	28	.17	26	PI
		136	11	63	408	26					
104	U2	170	21	56	223	43	6778	28	.7	7	LA
		176	23	62	233	38					
105	U3	197	26	69	259	46	4317	31	.22	207	MA
106	U4	165	9	39	43	57	3482	28	.4	4	LP
107	U5	139	94	48	417	38	16171	87	.15	3.10	LP

KEY: PI = Late Paleoindian; EA = Early Plains Archaic; MA = Middle Plains Archaic; LA = Late Plains Archaic; LP = Late Prehistoric

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BOOK REVIEWS

Photography in archaeology and conservation. Second Edition. By Peter G. Dorrell. 1994. Cambridge University Press, Cambridge. 260 pp., figures, tables, references cited. $59.95 (hard), $22.95 (paper)..

The book *Photography in Archaeology and Conservation* covers a subject many archaeologists have regulated to a point where, in terms of contract archaeology, simpler is better; in other words, how to do the minimum and still receive some results. Dorrell, by contrast, discusses the various types of cameras, lenses, lighting, and film used to reproduce an accurate record of an object or location with as few visual abnormalities as possible, given the equipment and situation. The book is divided into 15 chapters beginning with an in-depth review of still photography history in archaeology. The book ends with a glimpse of the potential for electronic and digital recording. In its simplest form. the book is a how-to-guide with a series of lists describing specific needs for archaeological photography. Because Dorrell goes deeper into the thoughts and reasons behind the use of various techniques and equipment, our knowledge of photography in the recording of the archaeological record is increased.

Dorrell's chapter on the history of photography notes the major advances in photography from the middle of the nineteenth century into the first portion of the twentieth century. The main focus of the chapter concerns how archaeology first used photography. Dorrell uses examples varying from ruins in the Middle East to the photography of William Henry Jackson at Mesa Verde. This history shows how the camera began to demonstrate its full potential as an aid in the recording of antiquities and site locations.

In Chapter Two, Basic Principles and Practices of Photography, Dorrell assumes the reader possesses some working knowledge of photography beyond the ability to use a point and shoot camera. This fact may prove to be a source for winnowing out the most technologically inept. For the remaining readers, Dorrell gives well-defined explanations of the terms he uses. It may still require his audience to reread the materials more than once to grasp their meaning. The principles stated here are highly important in producing accurate and informative photographic records. The chapter covers topics concerned with perspective, distortion, focussing, exposure, and depth of field.

Various types of equipment are discussed in Chapter Three. Dorrell covers large and medium format (film size) cameras and the more popular 35 mm cameras. Dorrell spends the greatest amount of time on large format cameras, extolling their virtues and abilities. He then glosses over the medium format camera and spends only slightly more time on the 35 mm camera. In his discussions on the 35 mm camera, Dorrell includes three lists on various features of this camera type. The first list includes features needed for archaeology excavation and artifact photography. The second list suggests additional features that may aid in photographic recording but are not essential. The cost and actual amount of use are the deciding factors in their acquisition. His third list deals with camera features to be avoided. Dorrell continues this chapter by generally discussing camera types. He states metal camera bodies are preferable to plastic. It is Dorrell's opinion point and shoot single lens cameras and rangefinder cameras should be avoided because of the absence of certain valuable features. He does suggest the usefulness of these two camera types as a light weight, backup system. Following a review of lens options for the three sizes of cameras, Dorrell digresses into a discussion of techniques when using a large format camera. He ends the chapter by examining light meters, filters, and photographic scales.

Chapter Four contains information on the use of artificial lighting. This good, concise chapter examines how lighting works and the various types of flash photography available.

Materials for processing and printing in a variety of dark room settings are covered in Chapter Five. These darkrooms can vary from a simple changing bag to a temporary field darkroom, or even a more elaborate laboratory facility. The minimum equipment and chemicals are suggested for each level of darkroom facility. Film type (i.e., black and white, slide, and print), film speed, and estimates on the quantity of film needed for various situations are considered when stocking a variety of situations. Dorrell discusses problems such as access to an electrical power source when deciding the practicality of a field darkroom.

Chapters Six through Eight cover three types of archaeological field photography. The three types, in order, are architecture and monuments, survey, and site photography. In the first of these chapters, Dorrell suggests angles and camera placement will show structures most accurately. His discussions include the need for photographing not only the overall structure but more detailed work as well. This detail includes photographing construction materials, rebuilding episodes, interiors and general structure setting. Dorrell also mentions the use of aerial photography and photographing the structures or monument in plan view.

Survey photography (Chapter Seven) includes not only what people in Wyoming may think of as survey archaeology, but photography used to document a variety of subjects. Dorrell uses the term to indicate museum displays, collections, buildings, topography, botanical variations, and site comparisons. The chapter includes an equipment list and suggestions for photographing in various situations. This chapter is basic, but a good reminder of what to watch for and what possibly to include in any photograph.

The chapter on site photography (Chapter Eight) covers the reasons behind why large format cameras are the wisest choice for this type of photography. In addition, Dorrell covers lens selection and ancillary equipment such as tripods, light meters, flash units, etc. He stresses the need for a clean photograph and how to accomplish this in various site situations. This chapter goes into detail on problems encountered in photographing various types of subjects found at excavations. These subjects include walls, pits, and subterranean chambers. The chapter then discusses general site photography and how to accomplish this with the aid of aerial and overhead shots. Dorrell suggests various apparatuses to give an elevated, oblique site view, and how to calculate the correct camera settings for these remote positions. Dorrell also covers the need for overall photographs of site profiles, and the photography of in situ artifacts. Finally he stresses the need to have photographs of people. Site workers showing various techniques and people showing the local setting can be used for presentations, instruction, and as a record of site procedures. Toward this end, Dorrell gives suggestions on ways to improve photographs with people in them.

Chapter Nine, titled Principles of Object Photography, deals mainly with laboratory artifact photography. This informative chapter includes advice well worth noting. Dorrell covers the use of filters, scales, setting, and camera exposure. Reasons behind his advice are also discussed.

Chapter Ten deals with close-up photography. Here again, Dorrell shows his bias for the large format camera, but does give good descriptions and suggestions for equipment to be used with a 35 mm camera. His coverage on lighting and the use of scales is also very informative. Dorrell covers reciprocity failure (the fall off of light intensity), depth of field problems, and possible solutions to both. Dorrell also briefly discusses microphotography.

Chapter Eleven contains information on infrared and ultraviolet photography. He notes their use in the viewing of encrusted ceramics slips and viewing painted images under repainted objects. Dorrell discusses the techniques, film

type, and processing used for these two types of photography.

Chapter Twelve returns to the photography of objects. Although it is a replication of portions of Chapters Nine and Ten, Dorrell believes certain artifacts types need additional discussion. In this chapter, he deals with pottery, lustrous and translucent objects (i.e., coins, glass, flint), incised inscriptions, and organic materials. Good suggestions are given on how to improve results when photographing these artifacts.

Chapter Thirteen covers the photography of flat objects. These include paintings, manuscripts, drawings, and plans. Dorrell goes into great detail on the problems and solutions for reproducing accurate recording of these objects.

Chapter Fourteen covers the publication of fieldwork results. This section mentions various techniques for reproduction, but does not go into great detail on any one subject. Dorrell covers the use of the PMT (photographic-mechanical transfer) and photo-lithographs as commonly used techniques. Black and white and color reproduction is discussed. Potential problems when using color photography are also mentioned. In this chapter, he gives another reason to avoid the use 35 mm cameras. The reason is the size of the film image size in relation to the published enlargement size.

The final chapter (Fifteen) is a short section on the future of the field. Dorrell notes video equipment is now being used along with still photography. Dorrell states the normal video equipment in use today is not of the highest quality. He goes on to say as the quality improves, the use of this technique to catalogue artifacts and sites should and will be considered. As an instructional or educational tool, the use of video photography is valuable. The only drawback for use of video equipment are the skills needed to produce a quality product and the cost of the equipment. Dorrell also mentions digital recording (photo CD), scanning electron microscopes, and the use of new and improved standard still photography equipment. With the common acceptance of the 35 mm camera, Dorrell stresses the needs to be more consistent and to standardize the use of photography.

This book should prove useful as a reference on cameras and accessory acquisition, to gain new ideas in the use of cameras for field techniques, and for artifact recording in the laboratory. Although minor, the few negatives of the book should be noted and recognized. First, Dorrell writes in British idioms, as would be expected. Terms appear from time to time which will not be comprehensible to readers of "American" English. Most of the terms can be deduced from the accompanying text. Unfortunately, this is not always the case. Second, Dorrell's bias toward large format cameras, while very understandable, should have been more realistic. The most common technical camera in use today is the 35 mm camera. Either he should have devoted one entire chapter to the use of large and medium format cameras or he should mention their superiority before accepting the fact of the common usage of the 35 mm camera. Third, the book is repetitive when dealing with certain topics (e.g., lighting, scales, etc.). In Dorrell's defense, it may be difficult to define the use of these ancillary topics in only one situation. Finally, Dorrell digresses and wanders from his stated topic from time to time.

Overall, the book is a good reference work on photography in all phases of archaeology. The book also suggests ideas and techniques that may be unknown to the researcher and recorder. For these reasons, anyone using photography in an archaeological context would be wise to skim through this text for appropriate chapters. For persons planning extensive camera work, the entire text should be researched.

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