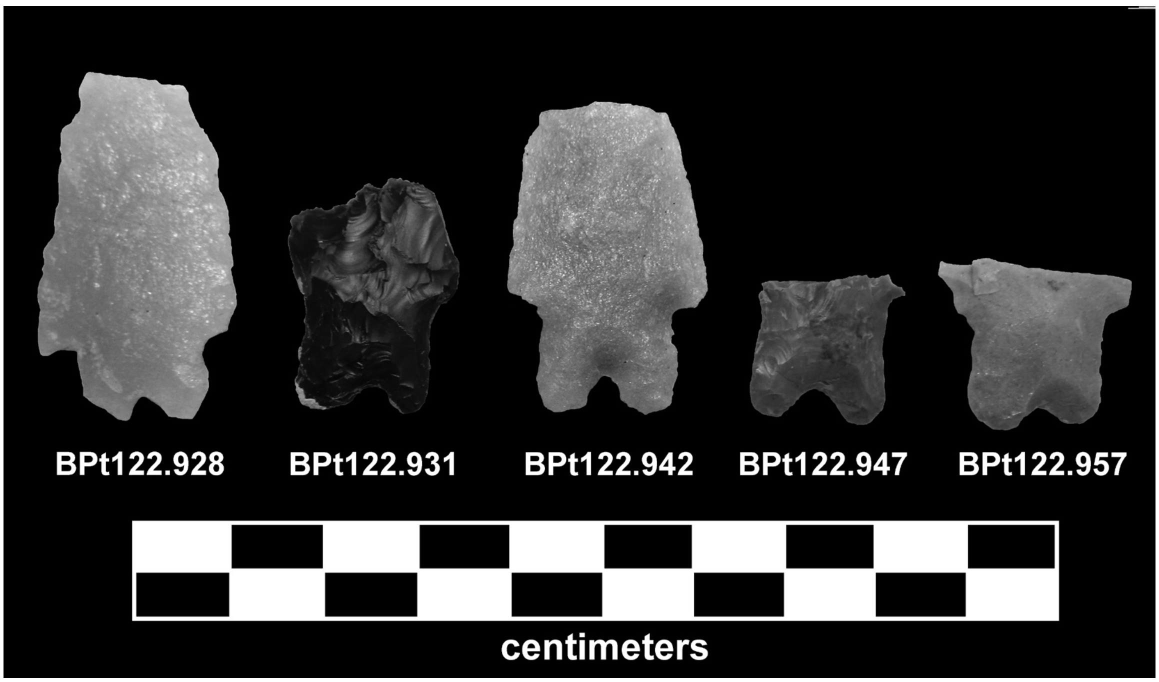
THE WYOMING Archaeologist

VOLUME 59; NUMBER 2; 2015



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THE WYOMING **Archaeologist**

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On the Cover:

Projectile points from SW5815. See article by Heidi Humphreys this issue.

Information for Contributors

THE WYOMING ARCHAEOLOGIST is published twice a year by the Wyoming Archaeological Society, Inc. Address manuscripts and news items for publication to: Dr Danny Walker, Editor; 1687 Coughlin St; Laramie WY 82072. Email dawalker@wyoming.com 307-399-0948

Please send a minimum of two (2) hard copies of each manuscript submitted. A third copy would speed the process. Please contact the Editor for instructions if the manuscript is available in electronic format. 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 all issues is July 1. Reports and articles received by the Managing Editor after those dates will be held for the following issue.

The membership period is from January 1 through December 31. All subscriptions expire with the Fall/Winter issue and renewals are due January 1 of 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 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 $0.25 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.

Society yearly subscription rates are as follows:
Individual Associate Member - $20.00
Institutional Member - $30.00
Canada and Other Foreign - $34.00

Other memberships may be available. Contact the Executive Secretary/Treasurer for information. Local chapter dues are in addition to state society dues. The Wyoming Archaeological Society is a Nonprofit Organization.

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THE WYOMING ARCHAEOLOGIST

VOLUME 59(2), FALL 2015

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THIS ISSUE PUBLISHED JANUARY 2017

WYOMING ARCHAEOLOGICAL SOCIETY MEMORIAL GIFT or CONTRIBUTION FORM

Given by: *Miss, Mrs., Mr., Ms., Dr.* $ ______________________________ *(Amount)*

Name: *Last* ______________ *First* _________________ *Middle* _____________

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Specify where you would like your money to go (e.g., Mulloy or Frison Scholarship Funds, The Wyoming Archaeologist, ???????)

Please make your check payable to THE WYOMING ARCHAEOLOGICAL SOCIETY
Send to Carolyn Buff, Executive Secretary/Treasurer, 1617 Westridge Terrace, Casper, WY 82604

WYOMING ARCHAEOLOGICAL FOUNDATION MEMORIAL GIFT or CONTRIBUTION FORM

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Please specify where your donation is to be placed.
Jensen/Robson Research Grant ______; Jensen/Robson PhD Travel Award _____;
Hell Gap Research _____; WAF General Operations ____; Other _____.

Please make your check payable to the WYOMING ARCHAEOLOGICAL FOUNDATION and mail to Barbara Nahas, WAF Treasurer, P.O. Box 725 – Cody WY, 82414; 307-868-2685.

Any funding for the George C. Frison Institute please contact Todd Surovell at University of Wyoming, Dept. 3431, 1000 E. University Avenue, Laramie, WY 82071; or email Surovell@uwyo.edu; or telephone 307-399-5437.

NEWS AND ANNOUNCEMENTS

Wyoming Archaeological Society, Inc.
2016 Annual Meeting Minutes
8:00 a.m. – Little America - Cheyenne, WY
Saturday, May 6, 2016

Presiding: Judy Wolf, President; Call to Order: 8:00 a.m.

Report of Credentials Committee/Roll Call of Delegates: Executive Secretary/Treasurer Carolyn Buff certified the voting delegates: Absaroka – Eric Rossborough and Bonnie Smith; Ancient Trails – Alice Tratebas; Casper – Patrick and Melissa Walker; Cheyenne – Dan Bach and Richard Curritt; Fremont County – Larry Amundson and Leneigh Schrinar; June Frison – Chris Rowe and Rachel Shimek; Pumpkin Buttes – Stacy Imus and Denise Tugman; Sheridan/Buffalo – Naomi Ollie; Sweetwater County – absent; and Upper Green River Basin - Dave Vlcek.

Roll Call showed nine chapters represented: Absaroka, Casper, Ancient Trails, Newcastle, Cheyenne, Fremont, June Frison, Pumpkin Buttes, Sheridan/Johnson County, Upper Green River. Absent was Sweetwater County.

Approval of Minutes of May 2, 2015: Motion by Dave Vlcek, second by Denise Tugman, to approve as published in Volume 57(2) Fall 2013 issue of *The Wyoming Archaeologist.* Carried.

Treasurer's Report: Executive Secretary/Treasurer Carolyn Buff gave the treasurer's report showing a total net worth of $80,975.26, a decrease of $4,966.56. The treasurer explained the decrease was due to having to refund an unused part of the Wyoming Cultural Trust Fund Grant received by Bryon Schroeder and to the fact several chapters had not submitted their dues before the end of the fiscal year.

Motion by Rachel Shimek, second by Bonnie Smith to file the treasurer's report for audit. Carried.

Auditor's Report: Jody Clauter, John Laughlin, and Denise Tugman certified the treasurer's report was in order.

Editor's Report: Danny Walker – Announced two issues of the journal had been published and we are two years behind schedule. Manuscripts are still needed.

Librarian's Report: Jody Clauter – The library continues to receive materials into the inventory, and the materials are available for check-out. We receive newsletters and journals from other societies.

Committee Reports: Scholarship: Carolyn Buff announced the Scholarship Committee would meet at lunch in the restaurant to evaluate the scholarship applications. She also announced Dr Richard McGinity, president of the University of Wyoming, had agreed to a partial $1,000 match to the scholarship amounts.

SAA/COAS: Marcel Kornfeld reported the Council of Affiliated Societies is made up of local and regional societies and SAA provides a table to display brochures, publications, etc. He also announced SAA would like to make it easier for societies to send a representative and attend the meetings. There is currently no newsletter being published but hopefully within the next year someone would take over the editorship.

Chapter Reports: The chapter reports will be published in *The Wyoming Archaeologist*.

State Archaeologist's Report: Greg Pierce – Has been working on the summer schedule and announced there may be a few opportunities for volunteers. Anyone interested may contact him or Marcia Peterson.

Old Business:

Wyoming Cultural Trust Fund Grant: After all bills were paid, the Society refunded $2,254.66 back to the Cultural Trust Fund from the Bryon Schroeder grant for the work he did on the Shirley Basin site.

Wyoming Archaeology Awareness Month: Judy Wolf reported Wyoming had placed second with the poster. She requested $250 for Archaeology Awareness Month in September and thanked the Society for the continued support. She announced chapters could pick up posters and t-shirts and caps were available for purchase.

Motion by Leneigh Schrinar, second by Rich Adams to donate $250 to WAAM. Carried.

Wyoming History Day: Danny Walker announced no archaeology award was given this year.

Frison Institute: No report.

Friends of the George C. Frison Institute: Motion by Denise Tugman, second by Leneigh Schrinar to appoint Richard Adams as the WAS liaison to the Institute. Carried.

Rich showed the Society the new logo for the Institute. It is the rabbit from Legend Rock and symbolizes outreach, research and education.

Wyoming Archaeological Foundation: Dave Vlcek, president, reported maintenance was a major objective this year at Hell Gap. A new screen door, new electric stove, new screens on the windows in the dining hall, painting of the ramps to the house and lab; lab fan/air maintenance, leaky pump/water source repair; major juniper clearing in the upper part of the arroyo were all done. This was accomplished by the crew, volunteers, Mary Lou Larson, Marcel Kornfeld, and forestry mostly by Alan Riggs of Denver.

Three, ten-day field sessions were held between July 4 and August 10. All visitors had an opportunity to view excavations of small Folsom and Agate Basin age bison bone beds and a Folsom point production area including channel flakes.

A National Historic Landmark nomination was submitted to the National Park Service. Marcel Kornfeld presented the nomination to the National Historic Landmark Review Board in Washington DC on November 17, 2015, and the nomination is currently in the process for approval. Judy Wolf and a number of Park Service personnel visited Hell Gap during the field session and reviewed several options for the future development of the property.

The summer WAS meeting was held July 24-26, along with an open house at the site. Flintknapping demonstrations and workshops by Bob Patten, Larry Langford and Bill Beekman were part of the program and meeting events. The Wyoming Atl-Atl and Social Club, in particular Russell Richard, organized the atl-atl throw for participants.

Web Site: Dan Bach and John Laughlin reported usage was going well and they work to keep the site updated. Judy Wolf thanked both men for the hard work and dedication to maintaining the site.

Names, addresses, etc.: Carolyn Buff requested names, addresses, phone numbers and emails be updated as soon as possible and to please provide zip +4s. Any piece of junk mail can provide the information. Just look at the address.

New Business

WAS Listserve: John Laughlin asked to set up a listserve for the Society and would like to switch to Google instead of Yahoo. This is an efficient way to get messages out to the membership via email. The consensus was John proceed with the listserve.

Plaque for Wagners: Marcia Peterson requested $800 from the Society toward the plaque for the donation of 20 acres of land at Legend Rock to the Archaeological Conservancy. Mike Bies displayed the plaque and explained the donation provides a linkage between the BLM land and the private land. This is the first site owned by the Conservancy in Wyoming. The area includes roughly 100 panels and affords recognition of the one of the premier sites in Wyoming. He explained the donation warrants special recognition to the land owners, Richard and Addy Wagner, for their foresight in the preservation of the site. The plaque included panels 81-87 in a 7 to 1 model of the images. The total cost of the plaque was $1,673.80, with WAPA giving $800 toward the project.

Motion by Leneigh Schrinar, second by Dave Vlcek to pay the remaining $873.80 for the plaque. Carried.

Archaeology Fair: Greg Pierce – Thanked the Society for the donation for the fair last year and announced it would be held September 10 at the Territorial Prison in Laramie. A request for $500 was made. Motion by Dave Vlcek, second by Rachel Shimek to donate $500 to the archaeology fair. Carried. It was also announced the Wyoming Archaeological Society would have a booth at the fair this year.

State Historic Preservation Office – Judy Wolf announced the 10-year preservation plan is now on the web site and available to all. She also announced the SHPO was fully staffed with Linda Kiisk hired as the historic architect and Erica Duvic was hired to replace Nancy Weidel as the CLG contact.

Survey Section: Michael Page has been promoted to survey section director. Work is slow but picking up.

Fall Activities: Greg Pierce reminded the membership of the Archaeology Fair.

Brochures, Letterhead, Envelopes, Membership Cards: are available by contacting Carolyn Buff.

Correspondence: Carolyn Buff noted there were thank-you notes on the table for perusal after the meeting.

Election of Officers: Sylvia Huber, chair, Absaroka Chapter, Denise Tugman, Pumpkin Buttes Chapter, and Mavis Greer, Casper Chapter.

Nominated and agreeing to serve were Sylvia Huber, president; Mavis Greer, 1st vice president; John Laughlin, 2nd vice president; and Danny Walker, member-at-large to the Wyoming Archaeological Foundation (term ends 2018). Nominated from the floor was Carmen Clayton for member-at-large to the Wyoming Archaeological Foundation.

Motion by Denise Tugman, second by Dave Vlcek to cease nominations and cast a unanimous ballot for the offices of president, 1st vice president and 2nd vice president. Carried.

A secret ballot was cast for the member-at-large to the Wyoming Archaeological Foundation position. Danny Walker won the election.

Nominating Committee procedures will be posted to the web site and will be passed on to the next committee.

2017 Nominating Committee: John Laughlin, 2nd vice president, June Frison Chapter, chair; Denise Tugman, Pumpkin Buttes Chapter; and Marcel Kornfeld, June Frison Chapter.

Selection of Site for 2017 Annual Meeting: The 2017 meeting will be held in Cody and hosted by the Cody Chapter.

Selection of Site for 2016 Summer Meeting: Invitation by Marcel Kornfeld to visit the Hell Gap site from July 29-July 31, 2016. Camping facilities are available on site. In addition, there will be an international symposium with Suyanggae and her Neighbors: Suyanggae and Hell Gap from the Cape of Good Hope to Tierra Del Fuego.

Announcements: Dave Vlcek announced the American Rock Art Research Association will hold its annual meeting May 27-29, 2015 in Las Cruses NM.

Please update your chapter officers and send any pertinent chapter information to John Laughlin or Dan Bach for inclusion on the web site.

The Wyoming Archaeological Foundation will meet at 7:30 a.m. in the restaurant with breakfast being ordered off the menu. The field trips will leave from the hotel parking lot at 9:00 a.m., weather permitting.

Carolyn Buff announced the WAS window clings and magnetic decals were available for sale here and from the website.

Jody Clauter announced voting is underway for the ten most important artifacts in Wyoming and the winner will be posted on the web site.

International Archaeology Day is October 15, 2016. The web site is www.archaeologyday.

org for anyone interested in posting their activities.

Other Business to Come before the Body: Dr Frison announced a tour was being held at the Sunrise Mine and it is a rare opportunity to see the site.

Back issues of *The Wyoming Archaeologist* are available for $1.00. Each chapter will take two boxes of journals back to their membership to do with as they please.

Adjourn: There being no further business, the meet adjourned at 9:15 a.m.
/s/ Carolyn M Buff
Executive Secretary/Treasurer

Golden Trowel Award: 2016 recipient Todd Guenther

Todd Guenther, recipient of 2016 Gold Trowel Award, with Carolyn Buff, WAS Executive Secretary/Treasurer.

Wyoming Archaeological Society, Inc.
Scholarship Committee
Minutes
May 7, 2016 – Restaurant – Little America – Cheyenne, WY
12:00 p.m.

Presiding: Carolyn Buff, Chair
Present: Dan Bach, Carolyn Buff, Jody Clauter, Greg Pierce (ex officio), Barbara Nahas, Paul Sanders, Brian Waitkus, Danny Walker, and Judy Wolf.

Carolyn Buff reminded all committee members that if they had printed the scholarship applications that they must then destroy them so that we are in compliance with the FERPA Act. We assure students that the applications will be destroyed after the granting of the money because of the personal information contained in the applications.

The Reiss Scholarship applicants were voted on by the Scholarship Committee in February with Morgan Robins being awarded $1,000.

Motion by Judy Wolf, second by Brian Waitkus to award $1,000 each to Zachary Garhart and Christopher Rowe for the Frison Scholarship. Carried.

Again this year Dr. McGinity of the University of Wyoming gave us partial matching funds in the amount of $1,000 toward the scholarship program.

Motion by Danny Walker, second by Judy Wolf to award $333 to each of the three scholarship recipients: Morgan Robins, Zachary Garhart and Christopher Rowe.

Our thanks are extended to Dr McGinity and the University of Wyoming Foundation.

In an effort to entice more students to apply for the scholarships, the following people agreed to again visit classes beginning early in January as soon as the second semester begins, to speak with students and faculty re the Reiss Memorial Scholarship: Casper, Carolyn Buff; Central, Leneigh Schrinar; Western, Russ Tanner; LCCC, Cheyenne and Laramie, John Laughlin; Northwest, Sylvia Huber; Sheridan, Vi Gardner; Gillette, Denise Tugman; Eastern, Alan Korell, and UW, Greg Pierce. Each person will take the appropriate application forms and encourage students to apply and faculty to write recommendation letters. It was decided that just emailing faculty was not a viable option at this time; that we needed to present to students face-to-face since the opportunities were not reaching the students.

Adjourn: 12:20 p.m.
/s/ Carolyn M Buff
Scholarship Chair

Wyoming Archaeological Society, Inc. Chapter Reports for the 2014-2015 Year

Absaroka:

Activities – Continue to provide chapter with Northwest College program information.

Public Education - Distributed Archaeology Awareness month posters around the Bighorn Basin, monthly chapter meetings with programs

Zachary Garhart, recipient of the Frison Scholarship, being presented by Carolyn Buff, WAS Executive Secretary/Treasurer.

Morgan Robbins, recipient of the Reiss Scholarship, being presented by Carolyn Buff, WAS Executive Secretary/Treasurer.

open to the public.

WAS Reiss Scholarship information presented to Northwest College students.

Absaroka Chapter Milford Hanson Scholarship information distributed to Big Horn Basin high schools.

Work With Other Organizations – Members are active in the Site Stewardship and Monuments and Markers program.

Awarded Milford Hanson Scholarship.

Members organized and participated in International Archaeology Day Museum Adventure for local elementary students through the Buffalo Bill Center of the West.

Other – Continued to expand the chapter library with a collection of DVDs, articles and books that can be checked out to chapter members.

Expanding email connections to share archaeology-based information and upcoming programming.

Programs Presented – Dr. Larry Todd, "Taphonomy of the Trinil Site: Revisiting *Homo erectus* in Java;" Sydnie NeVille, "Peru's Juanita;" Dan Eakin, "Archaeological Investigations along the Nez Perce National Historic Trail, Yellowstone National Park;" Gretchen Hurley, "Natural Trap Cave;" Dr. George Frison, Buffalo Bill Cente rof the West evening program;" Dr. Larry Todd, "Forty Days in the Wilderness: Summer 2015 Field Projects;" Bonnie Smith, "Eagles in Plains Indian Rock Art;" and Christmas Party/Gift Exchange.

Field Trips – Double D Ranch and Barry's Landing Hillsboro Ranch with interpreter.

Ancient Trails: The chapter has been largely inactive this past year and has not held regular meetings. Some planning was done to co-sponsor a historical trek along the Cheyenne-Deadwood Trail to be held last summer, but the event was postponed.

Field Work – The chapter intends to GPS map preserved segments of the Cheyenne-Deadwood Trail along Stockade Beaver Creek in the Black Hills. The chapter had surveyed to locate these segments several years ago and now plans to map identified trail remnants that are not overlaid by the Stockade Beaver Creek gravel road.

Casper: Programs Presented – Dr. Jody Clauter, "Old Collections, New Explorations: Recent Investigations at the Elk Mountain Site

WYOMING ARCHAEOLOGOCAL SOCIETY, INC.
Treasurer's Report for Fiscal Year Ending March 31, 2015
RELIANT FEDERAL CREDIT UNION

CHECKING ACCCOUNT	INCOME	EXPENSES	BALANCE
Beginning Balance	$4,684.96		
Deposits	$15,613.71		
Interest Earned	$2.75		
TOTAL INCOME - Checking	$20,301.42		
EXPENSES			
Merback Awards - Trowel Engraving		$15.95	
Connor Johnen - Frison and UW Match Scholarship		$1,500.00	
Sean Carroll - Frison and UW Match Scholarship		$1,500.00	
Wyoming Archaeological Foundation - Annual Dues		$366.00	
Fremont County WAS - Student Registrations/Meals		$1,155.00	
Wyoming Archaology Fair		$500.00	
Wyoming Archaology Awareness Month		$250.00	
Greg Pierce - Honorarium		$300.00	
Central Wyoming College - Reiss and UW Match Scholarship		$2,000.00	
Staples - Supplies (paper, printer ink, etc)		$195.79	
Sheridan/Johnson County WAS - Overpayment		$8.00	
Move to Reiss Certificate of Deposit - Silent Auction Proceeds		$492.75	
Connor Johnen - Map Making, Etc. - Schroeder Grant		$510.00	
Society for American Archaeology - Annual Dues		$35.00	
Wyoming Cultural Trust Fund - Refund Schroeder Grant - Unused Funds		$2,254.66	
Reimburse Casper Chapter for Guest Lecturer		$100.00	
United States Postal Service - Bulk Permit		$225.00	
Reliant Federal Credit Union - Visa Card - Postage		$9.99	
United States Postal Service - Bulk Permit		$147.00	
Danny Walker - Labels, paper, envelopes for spring meeting		$50.85	
University of Wyoming Copy Center - Printing of Journal		$1,136.20	
Reliant Federal Credit Union - Visa Card - Secretary of State Corporation Fees		$27.00	
Craig Lee - Airline Ticket		$354.20	
Modern Printing - Mailing		$114.00	
University of Wyoming Copy Center - Printing of Journal		$1,186.50	
History Day		$100.00	
Modern Printing - Mailing		$57.00	
TOTAL EXPENSES		$14,590.89	
ENDING BALANCE - Checking Account			$5,710.53
SAVINGS ACCOUNT			
BEGINNING BALANCE	$125.01		
Interest Earned	$0.12		
ENDING BALANCE			$125.13

MONEY MARKET ACCOUNT - 0040

BEGINNING BALANCE	$7,785.63		
Interest Earned	$7.08		
ENDING BALANCE		$7,792.71	

MONEY MARKET ACCOUNT - 0041 (BLM)

BEGINNING BALANCE	$9,279.32		
Interest Earned	$8.39		
ENDING BALANCE		$9,287.71	

Total available after March 31, 2011 = $7,204.71 for Big Horn Basin projects, digitization, and report-writing

MONEY MARKET ACCOUNT - 0042 (SCHROEDER)

BEGINNING BALANCE	$5,850.00		
Interest Earned	$3.20		
Trespass Fee		$200.00	
Food, Supplies		$803.85	
Sun Shade Reimbursement		$52.49	
Obsidian Sourcing		$900.00	
Porta Potty		$110.00	
Porta Potty		$182.00	
Dating		$837.00	
Connor Johnen - Map Making		$510.00	
Wyoming Cultural Trust Fund - Refund of Unused Funds		$2,254.66	
Total Expenses		$5,853.00	
Close Account		$5,853.20	
ENDING BALANCE			$0.00

CERTIFICATE OF DEPOSIT - 00100

BEGINNING BALANCE	$44,724.72		
Interest Earned	$400.03		
ENDING BALANCE			$45,124.75

CERTIFICATE OF DEPOSIT - 0101 - Reiss Account

BEGINNING BALANCE	$12,401.50		
Interest Earned	$40.18		
Deposit - Silent Auction Items	$492.75		
ENDING BALANCE		$12,934.43	

TOTAL NET WORTH AS OF MARCH 31, 2015			$80,975.26
Total Income	$95,566.15		
Total Expenses		$14,590.89	
Net Increase (Decrease)			$(4,966.56)

Carolyn M Buff
Executive Secretary/Treasurer

(48CCR301);" Marcia Peterson, "Paleoindian Presence in the Cloud Peak Wilderness Area of the Bighorn Mountains;" Dr. Kent Sundell, "Twyfelfontein Petroglyphs, Namibia;" Dr. Danny Walker, "River Flooding at Fort Laramie National Historic Site: Nothing New After Thousands of Years;" Dr. Kerry Lippincott, "Interior Engravings on Northern Plains Marine Shell Gorgets;" Dr. Todd Surovell, "Wyoming's Other Mammoth Kill: The La Prele Mammoth Site, Converse County, Wyoming;" David Eckles, "The Garrett Allen (aka Elk Mountain) Site Collection;" and Colin Ferriman, "Sites Along the Dead Horse Lateral Pipeline Corridor, Utah".

Cheyenne: Programs Presented – Dr. Jody Clauter, "Old Collections, New Explorations: Recent Investigations at the Elk Mountain Site (48CCR301);" Dave Eckles, "Chipped Stone Raw Materials Found at the Garrett Allen Site near Elk Mountain;" Marcia Peterson, "Alpine and Ice Patch Archaeology in the Caribou-Targhee National Forest and Grand Teton National Parjk and Paleoindian Presence in the Cloud Peak Wilderness Area of the Bighorn Mountains;" Spencer Pelton, "Younger Dyras-Aged Fluting, Cold, and Time Budgeting in the Plains and Rocky Mountain Regions;" Dr. Robert Brunswig, "Exploring Old and New World Mountain Landscapes: Collaborative Archaeology in the Southern Rockies and Carpathian Tatras;" Dr. Danny Walker, "Floods at Ft. Laramie National Historic Site;" John Laughlin, "Ten Thousand Years in Ten Days at the Moriah Ranch;' and the movie, "Wyoming's Atlantic Rim Historic Trails".

Fremont County Chapter: Survey – GPS high altitude petrified wood toolmaking sites, photographed rock art and ruins in Utah, and photographed Coal Draw Rock Art.

Public Education – Distributed Wyoming Archaeology Awareness month posters to schools and museums in Fremont County and all schools on the Wind River Reservation; put public service announcements on Wyoming Public Radio, county10.com, dailyranger.com, Riverton Ranger, KTRZ/KVOW radio and the Lander Journal.

Programs Presented – "South Pass City: 45 Years of Archaeological Research;" "Shafting and Hafting of Projectile Points;" "What We've Learned and how Things Have Changed Over the Last 30 Years; Central Wyoming College students practiced presenting their Power Point presentations; "Post-Fire Archaeology in the Washakie Wilderness: Recording Unknown Landscapes un Northwest Wyoming;" La Prele Mammoth Site;" "Tel Gezer;" "Prehistoric Toolmaking Sites;" "Utah Rock Art and Ruins;" and a field trip to the Dinwoody Petroglyphs.

Work With Other Organizations – Central Wyoming College students practiced presenting their programs; attendance at the Frison Institute board meeting; Fremont County Library System; Greer Archaeological Consultants; Absaroka Range projects with Larry Todd; and volunteering at Legend Rock.

Publications/Reports – Printed annual shirt pocket membership booklets for the Fremont County Archaeological Society listing goals of WAS, online sources of Wyoming archaeology reports, membership, programs and history.

June Frison Chapter: Programs Presented – Marcia Peterson, "High Elevation Archaeology of the Caribou-Targhee and Bighorn National Forest;" Dr. Todd Surovell, "Wyoming's Other Mammoth Kill: The La Prele Mammoth Site, Converse County, Wyoming;" Dave Vlcek, "High Elevation Archaeological Research in the Wind River Mountains of Wyoming;" Spencer Pelton, "Younger Dryas-Aged Fluting, Cold, and Time Budgeting in the Plains and Rocky Mountain Regions;" Joshua Boyd, "Examining the Conditions of Folsom Endscraper Retouch Intensities;" Nathaniel Kitchel, "Paleoindians in the North Maine Woods: Using Geoarchaeology and Geochemistry to Better Understand the Peopling of the New World;" and Dave Eckles, "A Concentration of Canid and Small Mammal Bones From the Garrett Allen-Elk Mountain Site."

Pumpkin Buttes Chapter – Survey – Field trips to the La Prele Mammoth Kill Site and the Medicine Wheel.

Public Education – Presentation of Reiss Scholarship opportunity to students and faculty at Gillette Campus.

Work With Other Organizations – Members participated in the Native American Artifact Show co-hosted by the Chapter and the Rockpile Museum. WAAM posters and membership information was handed out.

Programs Presented – Dr. Todd Surovell, "The Ethnoarchaeology of Mongolia's Reindeer Herders;" Dr. Todd Surovell, "The La Prele Mammoth Kill Site;" and John Laughlin, "10,000 Years in Ten Days: Archaeological Work on the Moriah Ranch, Albany County, Wyoming."

Other – A $250 donation was made by the Chapter to the Rockpile Museum Association's fund raiser for the new Campbell County Rockpile Museum exhibits, a $250 donation was made to the Gillette Main Street Engraved Downtown Clock Campaign, and a $150 donation was made to the George C. Frison Institute.

Sheridan-Johnson County: Programs Presented – Cody Newton, "Bison Robes and Baubles: Developing A Native History of the Fur Trade Through Archaeology;" Kevin Knapp, "Personal Experiences in Archaeology;' "Jason Weston and Jenny Nagra, "The Enigmatic Stone Circle;" George Shannon, "Mystic Maze Site;" Buck Damone, "Archaeological Context and the Importance of Properly Recording Artifact Location When They are Found;" Christine Varah, "The History and Significance of the Crow Irrigation Project: 1801-Present;" BJ Kristiansen, "The Peopling of the Americas and the Various Hypotheses of how this Occurred;" Lila Bull Chief: after finding four possible medicine wheels in the Cloud Peak survey area with SWCA interest was piqued to research the topic giving a cultural perspective of the Apsaalooke (Crow) on medicine wheels and to provide a comparison of medicine wheels found within the Big Metal Project area with medicine wheels found outside of that area. The review covers theories of what the medicine wheel was originally used for as well as stories from the Apaalooke culture and astronomical alignments and the stories associated with Apsaalooke astronomy.

Sweetwater – No report submitted.

Upper Green River Basin Chapter - Work with Other Organizations – Partnered with Sublette County Historical Society to hold meetings and presentations at the Museum of the Mountain Man.

Programs Presented – Todd Thibodeau talked about the Fort Bonneville historic site; Dave Vlcek, "Hawaiian Rock Art;" Mike Hawkins, "Lithic Identification;" and Dave Vlcek, "Southwest Rock Art."

AUDITING COMMITTEE REPORT
March 31, 2016

In accordance with the bylaws, the Auditing Committee has reviewed the Treasurer's books and records for the Wyoming Archaeological Society, Inc. for fiscal 2015.

AUDITING COMMITTEE SUMMARY
March 31, 2016

The Wyoming Archaeological Society, Inc. owns one checking account, one savings account, two money market accounts, and two certificate of deposit accounts at the Reliant Federal Credit Union, 4015 Plaza Dr, Casper, WY 82604.

Balance on hand March 31, 2015 - $85,941.82
- Receipts
  - Interest and Dividends - $461.75
  - Income - $15,613.71
  - Disbursements – $14,590.89

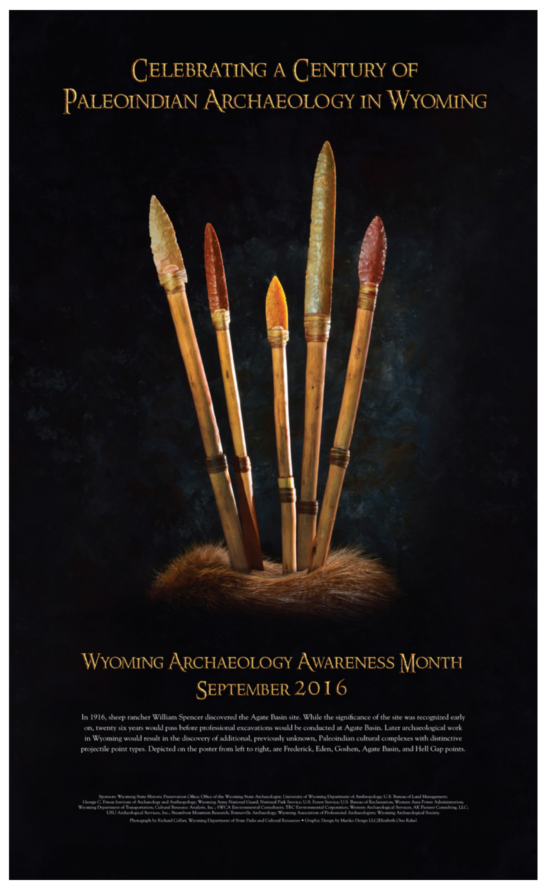
2016 WYOMING ARCHAEOLOGY AWARENESS MONTH

Governor Matt Mead proclaimed September to be Wyoming Archaeology Awareness Month at an event held at the University of Wyoming Department of Anthropology.

Balance on hand March 31, 2016 – $80,975.26
(a net decrease of $4,966.56)

Includes one (1) outstanding check(s) and no outstanding deposits.

Audited and found correct.
/s/ John Laughlin Date 05/06.2016
/s/ Jody Clauter Date 05/01/2016
/s/ Denise Tugman Date 05/06/2016



CHIPPED STONE RAW MATERIALS FROM THE GARRETT ALLEN (ELK MOUNTAIN) SITE, 48CR301

by
David G. Eckles and Adam Guinard

In this article, chipped stone raw materials from the Garrett Allen site are discussed, with emphasis on the stone tools. As indicated by Eckles (2103), who discussed the history of investigations and chronology, this is one of several articles to be presented on various aspects of the site's artifacts.

One of the remarkable aspects of the site is the variety of chipped stone raw materials. There are varieties of flint, chert, agate, jasper, chalcedony, petrified wood, orthoquartzite, metaquartzite, quartz, silicified shale, clinker, non-volcanic glass, obsidian, and basalt from many parts of Wyoming and surrounding states. The diversity of raw material types is present throughout the cultural deposits. There is no knappable tool stone on site; the only rocks are small fragments of drab, buff-gray sandstone. All culturally manipulated lithic materials were therefore brought into the site, many from considerable distances.

The site is located on private land in southeastern Carbon County, Wyoming at the northern end of the Medicine Bow Mountains and southern edge of the Hanna-Carbon Basin. It is within a homoclinal valley near the perennial Quealy Spring. Deposits are primarily alluvial, derived from the surrounding geological formations (Hayter 1981:31).

SITE DATING

Five carbon samples were submitted for radiocarbon dating during the 1979-1980 field school excavations. Three additional samples were submitted in 2013. One of the recent samples is from the early excavations and was taken from a unit at a relatively tight depth measurement of 44-48 inches. The other recent samples were obtained from residue on two large ceramic fragments. Correlation of the radiocarbon assays with the site deposits was provided by Hayter (1981:30) and Reider et al. (1987). The results of radiocarbon analysis from the archaeological deposits are listed (Table 1).

These results do not necessarily indicate discrete, well-dated components. Some mixing of younger and older materials is apparent given there is overlap in the depth of time-sensitive projectile points (Eckles 2013). Considering the complexities of the deposits and inconsistencies in vertical excavation controls, attempts to separate cultural components both during the field work and in the lab have been largely unsuccessful.

Fortunately, we do have depth measurements for most artifacts, including point-plotted artifacts (mostly the larger chipped stone tools) and artifacts grouped by unit level (flakes and smaller tools) with a depth range indicated on catalog cards or unit bags. Excavation in three- to six-inch arbitrary levels appears to have been the norm during the WAS project from 1969-1972, although this convention was not always followed. Mr. Allen and others at times excavated in larger depth increments, but at least did record on the catalog cards the end-

Table 1: Radiocarbon Dates, 48CR301

SAMPLE NUMBER	DATE SUBMITTED	RADIOCARBON YEARS B.P.	AREA OF SITE	DEPTH CORRELATION HAYTER (1981:30)
RL1406	1979-1980	510+/-110	SW Quadrant, 1979-1980	4-5 inches
D-AMS 004548	2013	591+/-25	Ceramic rim sherd residue	Unknown depth
RL1227	1979-1980	630+/-100	SW Quadrant, 1979-1980, Hearth, Level II	8-11 inches
D-AMS 004547	2013	797+/-33	Ceramic rim sherd residue	8 inches (depth from catalog card)
RL1228	1979-1980	920+/-110	SW Quadrant, 1979-1980, Level III	17 inches
RL1414	1979-1980	1670+/-120	SW Quadrant, 1979-1980, Hearth	22 inches
D-AMS 004549	2013	2363+/-30	N-S Trench	44-48 inches
RL1420	1979-1980	3120+/-250	N-S Trench	56 inches

ing depths of many of the artifacts they found. Depth measurements from the 1979-1980 field school were more standardized and nearly all cultural remains in the collection from the field school are found in labeled unit bags with depth or level information indicated.

Given the difficulties with inconsistent vertical control and probable mixing of deposits, it is not possible to separate the various artifact classes into discrete components. At best, it appears analysis of the artifacts can be accomplished within arbitrarily selected depth increments compared across the depth sequence. This approach, of course, crosscuts time periods and components to an unknown extent, but we may be able to discern some patterns within the data at this "macro" level.

In this paper, analysis proceeded on the basis of depth increments of six inches. When depth measurements are presented, they will be the ending depth for the increment. For example, a depth shown as "6 inches" includes any artifacts recorded between 0-6 inches deep. A depth shown as "12 inches" includes artifacts from 7-12 inches deep, etc. A total of 1,949 chipped stone tools and cores are included in this analysis.

CHIPPED STONE RAW MATERIALS

A minimum of 19 different lithic types served as raw materials for the manufacture of chipped stone artifacts (Table 2). Identifications were made by sight examination with the assistance of a 20x magnifying glass. Artifacts were compared to known quarry samples housed at the University of Wyoming Archaeological Repository (UWAR). Wayne Sutherland, Wyoming Geological Survey was also consulted in the identification of several lithic types. Of course, sight identification of lithic raw materials is not always the most accurate way to determine a source location. Many raw materials from the same geologic outcrop can vary in appearance and raw materials from widely separated source areas often have similar visual characteristics. There are, however, several distinctive stone raw materials which can be identified to source location with greater confidence (Table 2).

THE LITHIC RAW MATERIALS AND SOURCE AREAS

"Local" Cobble Deposits

Up to 40 percent of the chipped stone artifacts recovered from the site are most likely derived from cobble sources along the North Platte River Valley and its major tributaries. Several cores and large flakes from the site retain from 10-90 percent of their original cortex, and all exhibit smooth, rounded surfaces typical of river cobbles and pebbles. There are no outcrops of tool stone on the site, and the closest sources of knappable stone are found in Quaternary aged deposits from 3 to 20+ miles away. These deposits include a variety of cherts, quartzites

Table 2: Lithic Raw Material Types and Source Areas, 48CR301

ROCK TYPE	COMMON NAME	PROBABLE GEOGRAPHIC LOCATION	ID CONFIDENCE
River cobbles	Chert, quartzite, basalt, chalcedony, quartz, granite	SC WY, SE WY (North Platte River Drainage)	High
Shale Deposits	Silicified shale	SE WY, SC WY (Hanna/ Carbon Basin, Rawlins Uplift)	High
Red orthoquartzite	Red orthoquartzite	SE WY (Saratoga and Laramie Basins)	High to moderate
Metaquartzite	Metaquartzite	SE WY (Med Bow Mts.)	High
Quartz	Quartz	SE WY, Central WY, SW WY	Very High
Petrified wood	Petrified wood	SE WY, SW WY	High
Chert	Rose chert	SC WY (Rawlins Uplift)	Moderate
	Kremmling chert	SE WY (Saratoga Valley), Northcentral CO (North Park)	Moderate
	Fossiliferous cherts	SC WY, SW WY	High
	Bridger brown	SW WY	Moderate
Chalcedony	Flattop	NE CO, SE WY	Moderate
Dendritic Agate	Marshall	East-central WY (northern Shirley Basin)	High
	Hartville	East-central WY (Hartville Uplift)	High
Zebra Flint	Tiger chert	SW WY, NW CO	Very High
Jasper	Jasper	SE WY, Central WY, North-central CO	Moderate
Other Orthoquartzite	Morrison quartzite	NE WY, North-central Wyoming, Central WY	High to moderate
	Spanish Diggings	East-Central Wyoming (Hartville Uplift)	Moderate
Clinker	Clinker and non-volcanic glass	NE WY, SE MT (Powder River Basin)	High
Obsidian	Obsidian	WY, ID, UT, CO, NM	Very High
Basalt	Basalt	WY, CO	Very High

and igneous rocks.

Quaternary aged river gravel, outwash, slope wash and landslide debris are found as thin caps on terraces, benches, and floodplains in the Saratoga Valley. These rounded cobbles and boulders are primarily quartzite transported from the Medicine Bow Range (Montagne 1991:34). Quaternary gravel, pediment, fan deposits, and gravel in floodplains and terraces are all common along the North Platte River throughout its course in southcentral Wyoming. These deposits are also present along Pass Creek, a tributary of the North Platte River located about 12-15 miles southwest of the site, the Medicine Bow River, a tributary of the North Platte River located about 20 miles north of the site, and Halleck Creek, a tributary of the Medicine Bow River located about three miles south of the site (Love and Christianson 1985). A possible quarry site, 48CR1246, reported along Halleck Creek, contains up to two meters of alluvial deposits which includes cobble quartzites and cherts (Waitkus 1980).

Shale

There is a small number of artifacts made of shale and silicified shale. While shale deposits are common throughout Wyoming, specific locations of knappable shales have not been reported in the literature. The nearest shale deposits to the Garret Allen site are in the Hanna/ Carbon Basin, just north, northeast and northwest of the site. Upper Cretaceous-age deposits with shales include the Lewis Shale, Mesaverde Group, Fox Hills, Lance and Medicine Bow formations in the Hanna/Carbon Basin, Haystack Mountains, Rawlins Uplift and Washakie Basin of southcentral Wyoming and portions of the Laramie Basin south of Rock River. Lower Tertiary shales of the Ferris and Hanna formations are also found in this area (Gill et al. 1970).

Red Orthoquartzite

The Pennsylvanian-Permian-aged Casper formation is exposed along the flanks of the Laramie Range, at the southern end of the Laramie Basin, the Centennial syncline, and the Elk Mountain, Flat Top, Freezeout Hills and Platte

River Uplifts (Knight 1929:50). It contains dark red to orange red, salmon pink, brown, yellow and white colored quartz sandstones. Limestone facies are found at various depths within the formation (Knight 1929:52-54).

Red, pink and purple colored orthoquartzites are present at several locations in the Casper formation sandstones. Konkel (1935:15-16, Plate IX) reports quartzites (colors not mentioned) in the Marshall area of northern Albany County. Harrison (1938:29) found red and purple orthoquartzites north of Wheatland Reservoir, red and buff orthoquartzites (and red chert) in deposits southwest of Garrett (Harrison 1938:38), and pink quartzite and chert south of Marshall. A prehistoric quarry (site 48AB1117) recorded in northeastern Albany County contains pink/red quartzite extracted from Casper formation deposits and made into early stage bifaces (Metcalf Archaeological Consultants 1998). Randall (1963:4) reports a quarry site called Sheep Creek in northern Albany County containing red, pink and tan/yellow orthoquartzite. This location was also reported by Sutherland (1990:20).

In the southern Rock Springs Uplift and southern Green River Basin, clasts of red orthoquartzite in a white tuffaceous sandstone are found in the Oligocene-age Bishop Conglomerate (Love and Christiansen 1985). The Bishop Conglomerate is stratigraphically equivalent to the Oligocene White River formation within Wyoming.

There appear to be some remnants of the Bishop Conglomerate in the Saratoga Valley. Buffler (1967:plate 4) includes the Bishop Conglomerate in the area of Browns Park Formation rocks west of Saratoga. Equivalent Browns Park Formation sediments extend north and northwest from Saratoga to the Hanna Basin and Rawlins (Buffler 1967:79).

A specimen of red orthoquartzite and red jasper from the Saratoga Valley is on display in the Saratoga Museum; it is nearly identical to many of the specimens in the Garrett Allen assemblage. This rock fragment was found in an area between the town of Encampment and the Colorado state line from an aboriginal quarry (Rod Laird, personal communication, 2013).

Metaquartzite

Metaquartzite is metamorphosed quartz sandstone often found in Precambrian cored mountains. Sources near 48CR301 include the Medicine Bow and Sierra Madre Mountain Ranges (Houston and Karlstrom 1991). Cobbles and pebbles of various metaquartzites are often found in Quaternary-age gravel deposits derived from nearby mountain ranges. They can also be found in conglomerates of various geologic ages.

Quartz

Crystalline quartz often forms in veins in metamorphic and igneous rocks and is common in Precambrian-cored mountains (Sutherland 1990:42). Coarsely crystalline quartz includes milk-white, rose-pink, yellow, smoky gray and transparent (rock crystal) varieties (Hausel and Sutherland 2005; Sutherland 1990). Most of the quartz artifacts at the site are of the milk-white variety (vein quartz) found in Wyoming's mountain ranges (Sutherland 1990:42). Vein quartz is ubiquitous in the Sierra Madre Mountain Range (Miller 1971:25) as well as the Medicine Bow, Laramie, and Wind River Ranges (Hausel 1986:58). Rose quartz has been reported from the Pennsylvanian age Amsden Formation in the Rawlins Uplift (Barlow 1953). Green and purple quartz veins have been found from east of the Seminoe Mountains and west of the Shirley Mountains (Finnell 1951:29). Black and white quartz associated with pegmatite dikes is known from the southwestern portion of the Shirley Basin, east of the Freezout Mountains (Lovering 1929:217).

A few artifacts from the site were made on pyramidal crystals. Such crystals are found in Precambrian rocks at the extreme southern end of the Laramie Basin near the Colorado border. Clear quartz crystals have also been reported from the Encampment and Battle Lake areas in the Sierra Madre Mountains and the Marshall area in the northern Laramie Range (Hausel and

Sutherland 2005:191; Root 1972:13).

Petrified Wood

Petrified wood is organic woody material replaced by cryptocrystalline quartz or opal (Sutherland 1990:13). Sources of petrified wood include the Saratoga Valley north of Saratoga. These silicified woods appear to have been derived from tuffaceous sandstones, siltstones and claystones of the Miocene age North Park Formation (Hausel and Sutherland 2005:190; Montagne 1955). Other sources are in the Shirley Basin near Marshall (northern Albany County), the Eden Valley in southwestern Wyoming and in the Powder River Basin south and southeast of Buffalo (Hausel and Sutherland 2005:190). Black (2000:134-135) reports several petrified wood source areas in North Park and Middle Park, Colorado.

Rawlins Uplift Rose Chert

The Pennsylvanian-age Amsden Formation contains several cherts in northwestern Wyoming, the Bighorn Mountains, northern Overthrust Belt and Rattlesnake Mountains of the central Wind River Basin (Miller 1991:462). Cherts have also been reported from Amsden Formation deposits in the Rawlins Uplift. These include a yellow altered chert in a red silty calcareous sandstone matrix and abundant red chert in limestone beds (Barlow 1953:175-176). Specimens in the 48CR301 collection appear as red, pink, yellow and gray banded(?) chalcedonies which Mark Miller (personal communication, 2013) identified as coming from the Amsden Formation in the Rawlins Uplift. These cherts are derived from the same facies as the rose quartz discussed above.

Browns Park (Kremmling) Chert

Exposures of the Miocene-age Browns Park Formation in North Park, Colorado and the Saratoga Valley, Wyoming contain opaline, milky, opaque to translucent cherts. Epigentic cherts in the upper portions of the formation are mottled with globular inclusions. Similar cherts are found in the Troublesome Formation of Middle Park, Colorado (Benedict 1990:19; Miller 1991:471). The Colorado materials are often referred to as Kremmling cherts, and are generally white to gray and buff in color. They can be opaque or translucent, but are often a combination of the two. Opaque white chert inclusions are common, especially discrete spherical inclusions centered on iron-rich impurities which, when weathered, can leave cavities (Benedict 1990:19).

A recently examined prehistoric quarry near Saratoga, site 48CR5183, contains variegated cherts of the Browns Park Formation (Greubel 1992:8). Samples from this quarry are housed at UWAR and were examined for this analysis. These materials range from hues of light to dark gray, tan to dark brown, and black. Many of the specimens contain white spherical inclusions and have a thick limestone cortex covering an irregularly shaped nodule.

Fossiliferous Cherts

Fossiliferous cherts are known from the Green River Basin, Washakie Basin and Great Divide Basin and are present in several Eocene era geologic formations. These cherts are generally more rare in the Great Divide Basin and do not extend east past the northwestern margin of the basin (Miller 1991:468).

Michaelsen (1983) identified several source locations of fossiliferous cherts in the Washakie Basin. Oolitic cherts are made up of concentric laminae of calcium carbonate replaced by silica which surround a quartz or shell fragment. These ring-shaped oolites are generally about one millimeter in diameter. The oolitic chert matrix ranges from shades of brown to gray to black, while the oolites themselves are generally of a lighter color. Bioclasitc cherts consist of silicified fragments of shell or other organic material. Colors range from buff to brown, gray and purple. Algalitic cherts are silicified stromatolitic algal structures contained in a brown to dark brown matrix.

Another source of fossiliferous chert is in the Opal Bench area of southwestern Wyoming. These are opaque white to cream to dark brown cherts containing fossil algae, ostracods, marine snails, and shell fragments. They are found in Eocene-age Bridger Formation deposits (Brown 1980:21).

Several artifacts from the 48CR301 collection are made of Whiskey Buttes chert. This material is from the Whiskey Butte Bed of the Eocene-age Bridger Formation east of Fontenelle in the Green River Basin. This material consists of silicified algal logs and is opaque, porcellaneous and can be various hues of tan, brown, and black. It nearly always contains light blue opal inclusions, which makes it quite distinctive (Miller 1991:469).

In the Green River Formation are silicified gastropod coquinas, often referred to as *Goniobasis* agate, which contain the fossilized remains of gastropod shells of the genus *Goniobasis* (Miller 1991:468; Sutherland 1990:14). Source locations have been identified between the towns of Green River and Granger and in the Washakie Basin in southwestern Wyoming (Hausel and Sutherland 2005:188). Several artifacts in the collection appear to be of *Goniobasis* agate.

Bridger Brown Chert

Eocene-age Bridger Formation lake sediments in the Bridger Basin of southwestern Wyoming contain nodules of cherts and porcellanites. These nodules contain a translucent brown chert sometimes referred to as Lone Tree Chert (Miller 1991:468), or Bridger Brown Chert. Samples of Bridger Brown Chert at UWAR are a dark brown, almost caramel color grading to a brownish gray. They are generally translucent to nearly opaque.

Flattop Chalcedony

There is a large prehistoric quarry on Flattop Butte in northeastern Colorado (Greiser 1983). This butte is part of the Oligocene-age White River Group of sedimentary rocks. The chalcedony found here is generally lavender gray with a dull luster and white inclusions. The range of colors is from white to gray, brown, pink, and purple, with the lavender and gray hues the most common. It has a dull luster, can be opaque to translucent, and is fine-grained to waxy. Similar materials have been reported from Table Mountain in southeastern Wyoming (Hoard et al. 1993:700).

Dendritic Agates

A large number of the artifacts in the assemblage are made of variegated, opaque to translucent agates with a smooth waxy appearance and contain manganese oxides, commonly referred to as dendrites. In nearly all cases, the dendrites are black. Some appear as streaks, but most are relatively small round specks, often with concentrations of specks resembling the pattern of moss or a fern.

Dendritic agates are common in the Mississippian-age Madison Formation of the Bighorn Mountains, Black Hills, and Hartville Uplift in the Guernsey, Wyoming area (Miller 1991:461). Moss agates are also common in the Sweetwater Arch region of central Wyoming (Root 1972:15). Prehistoric procurement areas containing variegated dendritic agates have been identified in northern Albany County in the Marshall area (Craig 1983:37).

Rock samples from the Marshall, Wyoming area prehistoric quarries housed at UWAR contain a variety of dendritic agates, ranging from completely opaque to translucent, and ranging in coloration from dark purple, various hues of brown, cream to buff, red to maroon, and black. Most of the artifacts from 48CR301 made of dendritic agate closely resemble these samples. One biface fragment from 48CR301 is made from an opaque white to pale blue agate and contains dendrites in moss patterns. This specimen is similar to a sample of Marshall Agate illustrated by Root (1972:10, Plate III). There are fewer examples of densely opaque yellow to brown dendritic agates in the site collection resembling those commonly found in the Hartville Uplift. None of the dendritic agates from the collection appear to be similar to the Sweetwater moss agates. The Marshall Quarry samples also include maroon, dark brown and yellow-brown jaspers.

Sutherland (1990:25-26) reported dendritic agates and non-dendritic jaspers in several outcrops of the Casper Formation in the Marshall area. In fact, one of these locales corresponds to the location of site 48AB314, a prehistoric quarry recorded in 1974 (Zeimens 1974). Another quarry site in this area is 48AB1117 recorded in 1999 by Metcalf Archaeological Consultants (Pool and Rosenberg 2000). This site is located on the slopes of an isolated butte, an outcrop of Pennsylvanian age Casper Formation sandstone (Love and Christiansen 1985). Orthoquartzites and jaspers were found at this site in abundance.

Zebra Flint (also called Tiger Chert)

A distinctive banded flint is found in deposits of the Eocene-age Green River Formation of extreme southwestern Wyoming and northwestern Colorado. This is referred to as Zebra Flint (Sutherland 1990:17), also referred to as Tiger Chert (Love 1977). The banding represents preserved lake varves (Miller 1991:467). These flints are generally various hues of brown and black. Love (1977:23) reported its distribution, either in situ or in lag cobbles, occurs south of the Blacks Fork River and west of the Green River. Large nodules erode from the slopes of Black Mountain and Cedar Mountain, west of Flaming Gorge. This appears to be the center of its distribution. Similar banded flints have been reported from the Sand Wash area of northwestern Colorado (Stucky 1997), and in the central and northern Green River Basin west of the Green River (Miller 1991:467).

Specimens of Zebra Flint often exhibit light and dark banding, but, in any given sample, portions of the rocks can be completely black with no visible banding. A few examples in the 48CR301 assemblage exhibit the typical banding, but also grade into a jet black material, or a gray to brown mottled material in which varves have been deformed.

Jasper

Jasper is a red to dark red and yellow to yellowish-brown opaque chalcedony (Sutherland 1990:13). A reddish-brown jasper is known from Pennsylvanian-Permian-age Casper Formation limestones in the eastern portion of the Shirley Basin near the Laramie Range (Hausel and Sutherland 2005:190). Specimens from aboriginal quarries in the Marshall area also contain red, maroon and brown jaspers. Randall (1963:4) reports a quarry in southwestern Natrona County containing red and brown jasper. This site is also mentioned in Sutherland (1990:25) as a source of jasper. Jasperized breccias containing dark red, dark brown and yellow-brown jasper occur in the western Granite Mountains of central Wyoming (Hausel and Sutherland 2005:190). Specimens of this jasper often exhibit both yellow-brown and dark red colors within the same rock (Hausel 1996:2).

Jaspers have been documented in central Colorado as well. One is known as Trout Creek Chert, a yellow-brown to dark red jasper outcropping in Ordovician-age deposits west of South Park, Colorado. Other sources of similar jasper have been found in the Threemile Gulch area of eastern South Park (Black 2013:11), and the Table Mountain area of Middle Park (Benedict 1990:19).

Banded Iron Formation Jasper

A layered jasperized banded iron formation rock is known from the Bradley Peak area of the Seminoe Mountains in southcentral Wyoming. It is also found in stream gravels near Miracle Mile along the North Platte River. These rocks have alternating bands of brown jasper, black magnetite, dark gray quartz and grunerite. They are often magnetic (Hausel and Sutherland 2005:190; Sutherland 1990:15). Some lithic tools and flakes from the site have similar appearances to the banded iron formation jaspers, but a firm identification as such has not been established. None of the examples in the Garrett Allen collection are magnetic.

Morrison Formation Orthoquartzite

Distinctive orthoquartzites have been reported from the Upper Jurassic-age Morrison

Formation. These are fine grained quartzites occurring in nodular form and are generally a light gray color. The material is often streaked or banded with shades of gray, yellow and a rust color. The streaked appearance is from fossil burrows known as fucoids (Francis 1983:41; Miller 1991:464). Source locations have been identified in the Bighorn Mountains of north-central Wyoming, the Black Hills and peripheries of the Powder River Basin of northeastern Wyoming, and the Sweetwater Arch of central Wyoming (Miller 1991:464).

Spanish Diggings Orthoquartzite

The Spanish Diggings Quarry is located in east-central Wyoming north of Guernsey in the Hartville Uplift. It contains quarry pits where a fine-grained orthoquartzite in Jurassic-Cretaceous-age Morrison-Cloverly Formation sediments was mined throughout the prehistoric time frame (Miller 1991:464). This orthoquartzite does not have the fucoidal marks as seen in the Morrison quartzites. Colors include gray, tan, purple, brown, and orange hues. Spanish Diggings quartzite appears in archaeological sites throughout eastern Wyoming (Reher and Frison 1980:124).

Clinker and Non-Volcanic Glass

In the Paleocene-age Fort Union Formation of northeastern Wyoming and southeastern Montana are variable grades of clinker formed next to combusted coal seams. Useable tool stone clinker includes middle-grade varieties of clinker, sometimes referred to as porcellanite and non-volcanic glass (NVG). Colors of both can range from red to maroon to grays and black (Miller 1991:466).

Several artifacts in the collection were made from a jet black non-volcanic glass sourced to the Powder River area of southeastern Montana. This glass has a grainy texture (similar to basalt) and contains small, white, oval to round inclusions. Other non-volcanic glass artifacts in the collection are hues of red, maroon, gray and gray-green.

Obsidian

Primary sources of obsidian in Wyoming and surrounding states include the greater Yellowstone area, Jackson Hole, eastern Idaho, west-central Utah, southwestern Montana, and southcentral Colorado (Love 1977; Miller 2010). One secondary source in Wyoming has also been identified as obsidian pebbles on Late Pleistocene terraces mostly west of the Green River in southwestern Wyoming (Love 1977:21). A recently discovered location in extreme north-central Colorado also contains small obsidian pebbles (Hughes 2005).

Basalt

Basalt rocks in Wyoming are most commonly found in the Yellowstone-Absaroka field located in northwestern Wyoming. This is the largest volcanic field in Wyoming and is considered to be the source of most of the volcanic debris in the state. Basalt rocks are found in late Eocene, early Oligocene, Miocene, and early Pliocene deposits in this field (Houston 1964:16).

Basalt outcrops are known from the western edges of North Park, Colorado, in the area of Rabbit Ears Pass and Elk Mountain. Grouse Mountain Basalt overlies Troublesome Formation rocks and Rabbit Ears Volcanics (Bolyard and Sonnenberg 1997:165-166). Luedke and Smith (1978) show Late Cenozoic volcanic dikes and flows containing basalt rocks on the western side of North Park, Colorado, north and northwest of Steamboat Springs, up to and just over the Wyoming border in southwestern Carbon County. There are additional basalt dikes and flows south of Steamboat Springs and into Middle Park and central Colorado (Izett 1966:42).

West of North Park, basalt rocks are found in the Elkhead Mountain Volcanic Field which extends from Cedar Mountain near Craig, Colorado north to Battle Mountain, an extinct volcano located in extreme southwestern Carbon County, Wyoming (Carey 1955:44).

Closer to the Garrett Allen site in the Saratoga Valley between Walcott and Saratoga, cross-bedded conglomerates of the Browns Park Formation contain rounded clasts of Precambrian rocks, including basalt, rhyolite, andesite, and other extrusives. These conglomerates were transported from the Rabbit Ears and Never Summer volcanic fields in northern Colorado during Miocene times (Montagne 1991:25). In addition, ultrapotassic basalts have been reported from the late Cenozoic-age Leucite Hills of southwestern Wyoming (Ogden 1979:11).

SITE-WIDE COMPARISON OF RAW MATERIALS

The chipped stone tool assemblage from the site is diverse and contains projectile points and point preforms, bifaces (all stages), end scrapers, drills (both large and tiny hafted specimens), rectangular unifacially retouched flakes called limaces (Kornfeld et al. 2010:412), beveled knives, large choppers, cores, tested cobbles, tested and flaked pebbles, and a variety of unpatterned bifacially and unifacially retouched and utilized flakes (Table 3). This table also shows the relative frequencies of stone raw materials by depth for the chipped stone tools included in the analysis. Both complete and fragmented specimens are included in the counts.

The highest percentages are from the "local" cobble sources, with the dendritic agates comprising the second highest percentages and the jaspers and red orthoquartzites the third and fourth highest. Of interest is the presence of materials from relatively remote sources such as Zebra flint, fossiliferous cherts, Spanish Diggings orthoquartzites, Bridger brown cherts, Powder River Basin clinker and non-volcanic glass, Flattop chalcedony, and basalt. These materials are represented in most or all of the depth increments. Overall, the table shows minor differences in relative frequencies of all the raw materials throughout the sequence, with four possible exceptions. There are relatively more fossiliferous cherts in the deeper elevations, somewhat more clinker/NVG at 48 and 60 inches deep, with higher percentages of red orthoquartzites from 0-12 inches. Most of the obsidian tools occur in the upper 24 inches of the deposits.

The number of raw material varieties for each depth increment is also shown (Table 3). Within most of the depth increments, all or nearly all of the raw material types are represented, indicating consistency in raw material procurement over time. The depth increments of 37-42, 59-54 and 55-60 inches contain the lowest absolute numbers of artifacts and fewer numbers of raw material varieties, although even here over 50 percent of the raw material varieties discussed above are present. In sum, the diversity of raw materials is high throughout the sequence.

A plot of selected high identification confidence raw materials (Figure 1) is interesting because there are relatively consistent percentages of both "local" and "exotic" raw materials from all elevations. The spread between the high and low percentages rarely exceeds six percentage points, with most between one to five percentage points. These data indicate both nearby and remote raw materials are present at similar percentages from the late Middle Archaic to late Late Prehistoric with the few exceptions noted above.

PROJECTILE POINTS

Projectile point types from the Late Prehistoric to Middle Archaic have been identified in the collection (see Eckles 2013). They include the following arranged by rough time period:

Late Late Prehistoric (ca. 650-100 years B.P.):
- Plains side-notched (PLSN)
- Unnotched (Cottonwood) (UNN)
- Tri-notched (TRN)
- Tiny side- and corner-notched

Middle Late Prehistoric (ca. 650-1000 years B.P.):
- Prairie side-notched (PRSN)

Early Late Prehistoric to Late Late Archaic (ca. 1800-950 years B.P.):
- Rose Spring (RS)

Table 3: Number and Proportion of Raw Materials by Depth (inches), All Tools and Cores

RAW MATERIAL	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Cobbles	89 (33.1)	162 (34.8)	90 (32.2)	70 (32.4)	32 (34.0)	66 (34.2)	25 (35.2)	89 (32.7)	11 (33.3)	22 (38.6)
Red orthoquartzite	28 (10.4)	38 (8.1)	18 (6.5)	13 (6.0)	6 (6.4)	12 (6.2)	----	11 (4.0)	----	2 (3.5)
Rawlins Uplift chert	2 (0.7)	8 (1.7)	2 (0.7)	1 (0.5)	1 (1.1)	1 (0.5)	----	5 (1.8)	----	1 (1.7)
Silicified shale	1 (0.4)	8 (1.7)	2 (0.7)	3 (1.4)	1 (1.1)	4 (2.1)	1 (1.4)	4 (1.5)	1 (3.0)	----
Metaquartzite	2 (0.7)	----	1 (0.4)	1 (0.5)	1 (1.1)	1 (0.5)	----	1 (0.4)	----	----
Quartz	3 (1.1)	5 (1.1)	2 (0.7)	1 (0.5)	----	----	1 (1.4)	14 (5.1)	1 (3.0)	1 (1.7)
Kremmling chert	12 (4.5)	24 (5.20)	20 (7.2)	19 (8.7)	6 (6.40	15 (7.8)	8 (11.1)	18 (6.6)	3 (9.1)	4 (7.0)
Petrified wood	1 (0.4)	7 (1.5)	6 (2.1)	8 (3.7)	4 (4.2)	5 (2.6)	2 (2.8)	5 (1.8)	----	----
Dendritic agates	53 (19.7)	83 (17.8)	53 (18.9)	36 (16.7)	17 (18.1)	40 (20.8)	17 (23.9)	52 (19.1)	8 (24.1)	10 (17.5)
Spanish Diggings Orthoquartzite	9 (3.3)	17 (3.7)	7 (2.5)	7 (3.3)	4 (4.2)	6 (3.1)	----	4 (1.50	----	2 (3.5)
Flat Top chalcedony	3 (1.1)	3 (0.70	3 (1.1)	1 (0.5)	1 (1.10	2 (1.0)	----	1 (0.4)	----	----
Jasper	20 (7.4)	29 (6.2)	30 (10.7)	23 (10.6)	9 (9.60	16 (8.3)	8 (11.2)	28 (10.3)	4 (12.1)	4 (7.0)
Fossiliferous chert	10 (3.70	13 (2.8)	10 (3.6)	8 (3.7)	3 (3.2)	12 (6.2)	4 (5.6)	8 (2.9)	2 (6.1)	4 (7.0)
Zebra Flint	20 (7.4)	29 (6.2)	16 (5.7)	9 (4.2)	5 (5.3)	6 (3.1)	4 (5.6)	13 (4.8)	1 (3.0)	4 (7.0)
Bridger chert	5 (1.9)	14 (3.0)	4 (1.4)	7 (3.3)	2 (2.1)	3 (1.5)	1 (1.4)	4 (1.5)	1 (3.0)	1 (1.7)
Clinker, Non-volcanic glass	2 (0.7)	3 (0.7)	3 (1.1)	2 (0.9)	1 (1.1)	1 (0.5)	----	8 (2.9)	----	2 (3.5)
Morrison Orthoquartzite	1 (0.4)	5 (1.1)	8 (2.9)	3 (1.4)	----	1 (0.5)	----	4 (1.5)	1 (3.0)	----
Obsidian	5 (1.9)	15 (3.2)	2 (0.7)	1 (0.5)	----	----	----	2 (0.7)	----	----
Basalt	3 (1.1)	2 (0.4)	2 (0.7)	3 (1.4)	1 (1.1)	3 (1.5)	----	1 (0.4)	----	----
Total NISP	269	465	279	216	94	193	71	272	33	57
# of RM Varieties	19	18	19	19	16	17	10	19	10	12

(Columns may not total to 100 percent due to rounding)

Beehive Avonlea like
Late Archaic (ca. 1500-2200 years B.P.):
Besant
Early Late Archaic to Late Middle Archaic (ca. 1500-3200 years B.P.):
Pelican Lake/Elko (PL/Elko)
Middle Archaic (ca. 3000-5000 years B.P.):
McKean Stemmed

Using these type designations, the relative frequencies of raw materials by point type category can be presented (Table 4). Points from both excavated and surface contexts are included. The late Late Prehistoric points and other diagnostics referred to as the Shoshonean Suite (Larson and Kornfeld 1994) and Pelican Lake/Elko points are well represented in the assemblage, while the other point types occur in fewer numbers. There are a small number of points of unknown type from the Garrett Allen collection which are not included in this analysis.

Notable differences include a higher relative frequency of red orthoquartzite points among the PLSN/TRI/UNN category compared to the PL/Elko category, and the higher percentage of fossiliferous cherts among the PL/Elko points compared to the PLSN/TRI/UNN points. It is difficult to conclude much about the other categories of points given their small sample sizes, but it appears the Rose Spring corner-notched arrow points are made of raw materials originating primarily in southcentral and southwestern Wyoming while the Besant points are made of materials primarily from east-central and southeastern Wyoming. These two point types also have the lowest percentages of the

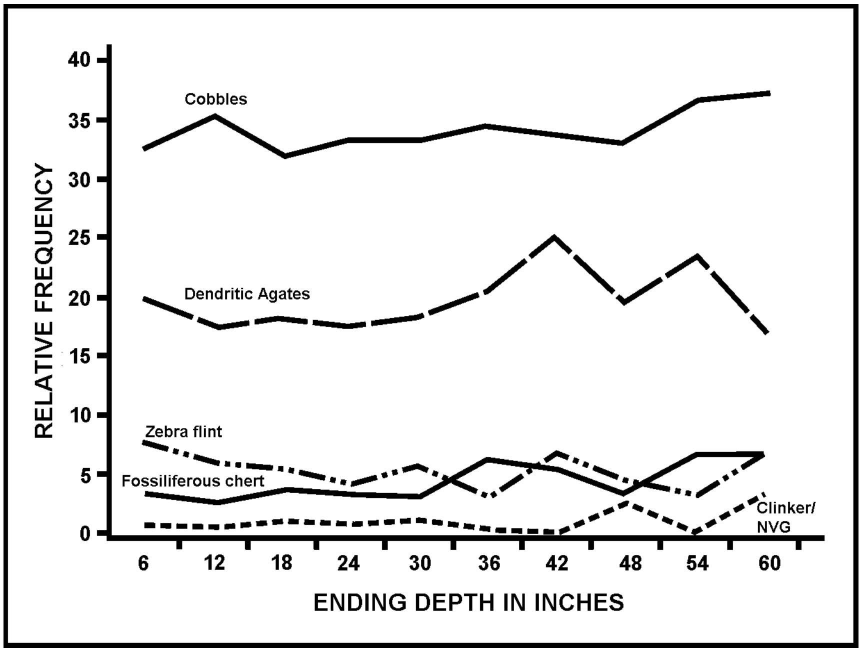


Figure 1: Relative frequencies of selected raw materials identified with high confidence.

"local" cobble materials. Most of the obsidian projectile points are Late Prehistoric types with one PL/Elko example.

END SCRAPERS

End scrapers show a different use of raw materials compared to all tools (Table 5). The range for cobble sources is 14-28 percent for the end scrapers compared to a range of about 32-38 percent for all tools. Thus, several of the more exotic raw materials appear to have been preferred in the manufacture of end scrapers. The highest percentages are among the dendritic agates, Zebra flint and jasper. There are lower percentages of Kremmling cherts, fossiliferous cherts, and Bridger brown chert. Obsidian, petrified wood, clinker/NVG, Morrison orthoquartzite, basalt, silicified shale, and Rawlins Uplift chert were rarely used for end scrapers.

DRILLS

There is a similar raw material use pattern among the drills (Table 6). Clearly, the more exotic raw materials were preferred in the manufacture of drills.

CORES, TESTED COBBLES, AND FLAKED PEBBLES

Cores, core fragments, and tested cobbles occur throughout the sequence and include 111 specimens (Figure 2). There are a variety of core types (see Andrefsky 2005; Conard et al. 2004) within the assemblage, including initial cores ("tested cobbles"), platform cores, mulitidirectional cores and several large bifacially flaked "roughouts" or biface cores (minimally processed pieces made at the source) (see Figure 3).

There is considerable variation in the percentages of raw materials used for cores and tested cobbles (Table 7). Cores made from river cobbles range from 22 to 80 percent across the depth sequence. Cores of dendritic agates range from 10 to 33.3 percent. Other raw materials used for cores show rather wide-ranging percentages. At least some of this variation is likely from small sample sizes in most of the elevations.

These data show the presence of a relatively large number of cores made of raw materials sourced to areas rather far from the site. There are cores from east-central Wyoming, south-central Wyoming, southwestern Wyoming,

Table 4: Number and Proportion of Raw Materials, Typed Projectile Points

RAW MATERIAL	PLSN, TRI, UNN	TINY POINTS	PRSN	BEEHIVE AVONLEA	ROSE SPRINGS	BESANT	PL/ELKO	MCKEAN
Cobbles	45 (36.0)	9 (39.1)	3 (37.5)	---	3 (20.0)	3 (17.6)	35 (40.2)	3 (42.8)
Red orthoquartzite	12 (9.6)	1 (4.3)	---	---	---	1 (5.90	1 (1.1)	---
Rawlins Uplift chert	---	---	---	---	2 (13.3)	---	---	---
Silicified shale	1 (0.8)	1 (4.3)	---	---	---	---	2 (2.30	---
Kremmling chert	2 (1.6)	---	1 (12.5)	1 (33.3)	1 (6.7)	---	2 (2.30	1 (14.20
Petrified wood	2 (1.6)	---	---	---	---	---	3 (3.4)	---
Dendritic agates	22 (17.6)	5 (21.7)	1 (12.50	---	---	8 (47.1)	15 (17.2)	1 (14.2)
Spanish Diggings orthoquartzite	5 (4.0)	1 (4.3)	1 (12.5)	---	---	3 (17.6)	---	---
Flat Top chalcedony	3 (2.4)	---	---	---	---	1 (5.90	---	---
Jasper	6 (4.8)	1 (4.30	---	2 (66.7)	1 (6.7)	1 (5.9)	6 (6.9)	1 (14.2)
Fossiliferous chert	5 (4.00	---	1 (12.5)	---	3 (20.0)	---	13 (14.9)	---
Zebra flint	5 (4.0)	---	---	---	---	---	2 (2.3)	---
Bridger chert	11 (8.8)	3 (13.0)	---	---	5 (33.3)	---	4 (4.6)	---
Clinker, NVG	2 (1.6)	1 (4.3)	---	---	---	---	3 (3.4)	1 (14.2)
Morrison orthoquartzite	---	---	---	---	---	---	1 (1.1)	---
Obsidian	2 (1.6)	1 (4.3)	1 (12.5)	---	---	---	---	---
Basalt	1 (0.8)	---	---	---	---	---	---	---
Total NISP	125	23	8	3	15	17	87	7
# of RM Varieties	15	9	6	2	6	6	12	5

Columns may not total to 100 percent due to rounding.

the Saratoga Valley, and possibly North Park Colorado sources. The quartz and metaquartzite cores were likely derived from sources in the Medicine Bow Mountains, or perhaps in other mountain ranges farther from the site.

All of the cores made of dendritic agates, Kremmling chert, jasper, Zebra flint, and Bridger Brown chert are exhausted, indicating intensive reduction and a preferred use for these materials. Cores made from river cobbles range from tested cobbles with several flakes removed to nearly exhausted specimens.

As might be expected, cores made from stream cobbles contain the highest percentages of cortex (Table 8). Most of the other cores generally retain little or no remaining cortex, although there are several specimens with up to 50 percent or more of remaining cortex. It is surprising for cores of exotic raw materials to have any remaining cortex at all considering the distances from their likely source areas.

FLAKED AND UNMODIFIED FLAT PEBBLES

The collection contains 18 small flaked pebbles (Table 9) made from relatively flat, dark brown and gray opaque to moderately translucent cherts and chalcedonies. They retain a wind-polished cortex which is almost certainly desert varnish. Most of the modified pebbles are shaped in the form of triangular bifaces. Raw materials are likely from the Eocene-age formations of the southwestern and southcentral Wyoming basins (Figure 4). An additional eleven unmodified, flat wind polished pebbles were recovered at various depths (Table 9).

QUARTZ ARTIFACTS

The Garrett Allen assemblage contains 467 quartz artifacts with provenience information from all elevations. Most are flakes, but there are several biface fragments, flake tools, cores and unmodified and flake pyramidal crystals (Table 10). About 39 percent are from 43-48 inches below surface and 35 percent are from 0-12 inches. A breakdown by quartz rock type is shown (Table 11). Nearly 77 percent of the specimens were made from milk quartz (vein quartz), which does not have the best flaking properties. In fact, most of the

Table 5: Number and Proportion of Raw Materials by Depth (inches), End Scrapers

RAW MATERIAL	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Cobbles	6 (27.3)	11 (24.4)	11 (22.9)	5 (21.7)	2 (20.00	5 (19.2)	6 (28.6)	10 (22.7)	1 (14.3)	2 (25.0)
Red orthoquartzite	----	----	1 (2.1)	----	----	1 (3.8)	----	1 (2.3)	----	----
Rawlins Uplift chert	----	2 (4.4)	----	----	----	----	----	----	----	----
Silicified shale	----	----	----	----	1 (10.0)	----	----	----	----	----
Kremmling chert	2 (9.1)	2 (4.4)	4 (8.3)	3 (13.0)	1 (10.0)	1 (3.8)	3 (14.3)	6 (13.60		
Petrified wood	----	1 (2.2)	1 (2.1)	1 (4.3)	----	1 (3.8)	----	1 (2.3)	----	----
Dendritic agates	7 (31.8)	12 (26.7)	13 (27.1)	6 (26.1)	2 (20.0)	4 (34.6)	7 (33.3)	14 (31.8)	4 (57.1)	3 (37.5)
Spanish Diggings orthoquartzite	----	1 (2.2)	2 (4.2)	----	----	----	----	----	----	----
Jasper	2 (9.1)	5 (11.1)	6 (12.5)	5 (21.7)	2 (20.0)	4 (15.3)	3 (14.3)	6 (13.6)	2 (28.6)	2 (25.0)
Fossiliferous chert	1 (4.5)	2 (4.4)	3 (6.3)	1 (4.3)	1 (10.0)	2 (7.7)	1 (4.7)	2 (4.6)		1 (12.5)
Zebra Flint	3 (13.6)	6 (13.3)	6 (12.5)	1 (4.3)	----	2 (7.7)	1 (4.7)	2 (4.6)	----	----
Bridger chert	1 (4.5)	1 (2.2)	1 (2.1)	----	1 (10.0)	----	----	1 (2.3)	----	----
Clinker, non-volcanic glass	----	----	----	1 (4.3)	----	----	----	1 (2.3)	----	----
Morrison orthoquartzite	----	1 (2.2)	----	----	----	----	----	----	----	----
Obsidian	----	1 (2.2)	----	----	----	----	----	----	----	----
Basalt	----	----	----	----	----	1 (3.8)	----	----	----	----
Total NISP	22	45	48	23	10	26	21	44	7	8

(Columns may not total to 100 percent due to rounding)

Table 6: Relative Frequencies of Raw Materials by Depth (inches), Drills

RAW MATERIAL	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Cobbles	----	----	----	2 (66.7)	----	----	1 (100.0)	----	----	----
Red orthoquartzite	----	1 (50.0)	----	----	1 (50.00)	1 (50.00)	----	----	----	----
Kremmling chert	1 (25.0)	----	----	----	----	----	----	----	----	----
Dendritic agates	----	1 (50.0)	1 (50.0)	----	1 (50.0)	1 (50.0)	----	----	----	1
(100.0)										
Spanish Diggings orthoquartzite	1 (25.0)	----	----	----	----	----	----	----	----	----
Flat Top chalcedony	1 (25.0)	----	----	----	----	----	----	----	----	----
Fossiliferous chert	----	----	1 (50.0)	----	----	----	----	----	----	----
Jasper	----	----	----	1 (33.3)	----	----	----	----	----	----
Zebra flint	1 (25.0)	----	----	----	----	----	----	----	----	----
Total NISP*	4	2	2	3	2	2	2			1

(Columns may not total to 100 percent due to rounding)

so-called flakes of milk quartz appear as thick, irregular "chunks" with few if any typical flake characteristics. The specimens of smoky gray and clear quartz have the best flaking properties and these specimens appear as "normal" chipped stone tools and flakes. The rose and yellow quartz artifacts tend to look much like those of milk quartz.

Cores of milk quartz range from prepared specimens with multiple facets to irregular chunks of rock with only one to four identifiable facets. There are also three unmodified stream

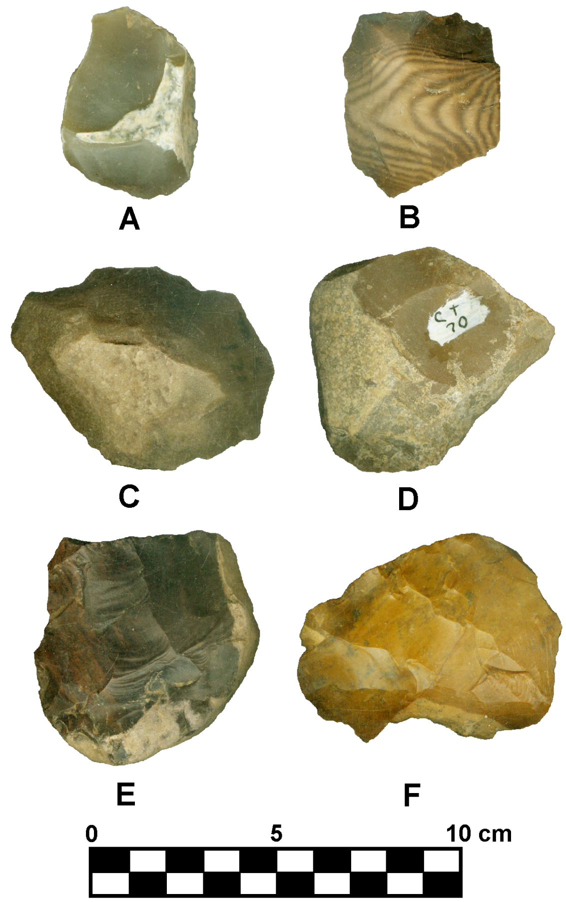


Figure 2: Cores and tested cobbles (A: chalcedony cobble core, B: zebra flint core, C; platform cobble core, D: tested cobble, E: jasper core, F: dendritic agate core).

pebbles of milk quartz.

Seven small pyramidal quartz crystals are flaked, with one or two flake scars removed from the apex of the crystal (Figures 5 and 6). An additional seven pyramidal crystals are unmodified (Figure 6A). One larger crystal found at 18 inches below surface (Figure 6b) is irregularly oval in shape with the thickest end flaked, exhibiting four flake scars on one side and two on the other. This has formed a 62-degree angle working edge which shows crushing from use. The opposite (narrower) end has one flake scar and possible polish. Perhaps this crystal was inserted into a bone or antler socket to facilitate its use as a tool.

Figure 3: Biface core of Kremmling chert found at 44 inches below surface.

Figure 4: Examples of flaked pebbles with wind polished cortex.

Figure 5: Selected flaked pyramidal quartz crystals and flake from crystal (D).

Figure 6: Example of unmodified pyramidal quartz crystal (A) and quartz crystal tool (B).

Table 7: Number and Proportion, Raw Materials by Depth (inches), Cores/Tested Cobbles

RAW MATERIAL	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Cobbles	2 (22.2)	8 (28.6)	4 (40.0)	6 (42.8)	5 (83.3)	3 (42.9)	1 (33.3)	8 (27.6)	1 33.3)	1 (50.0)
Red orthoquartzite	----	1 (3.6)	----	----	----	----	----	----	----	----
Metaquartzite	----	----	1 (10.0)	1 (7.1)	----	2 (28.6)	----	1 (3.4)	----	----
Quartz	2 (22.2)	6 (21.4)	----	1 (7.1)	----	----	----	10 (34.5)	1 (33.3)	1 (50.0)
Kremmling chert	1 (11.1)	1 (3.6)	1 (10.0)	----	----	----	----	1 (3.4)	----	----
Petrified wood	----	1 (3.60	2 (20.0)	1 (7.1)	----	----	----	----	----	----
Dendritic agates	1 (11.1)	5 (17.9)	1 (10.0)	4 (28.6)	1 (16.7)	1 (14.3)	1 (33.3)	8 (27.6)	1 (33.3)	
Jasper	2 (22.2)	2 (7.1)	----	1 (7.1)	----	----	1 (33.3)	1 (3.4)	----	----
Fossiliferous chert	----	1 (3.6)	----	----	----	----	----	----	----	----
Zebra flint	1 (11.1)	2 (7.1)	1 (10.0)	----	----	----	----	----	----	----
Bridger chert	----	----	----	----	----	1 (14.3)	----	----	----	----
Obsidian	----	1 (3.6)	----	----	----	----	----	----	----	----
Total NISP	9	28	10	14	6	7	3	29	3	2

(Columns may not total to 100 percent due to rounding)

OBSIDIAN AND BLACK NON-VOLCANIC GLASS ARTIFACTS

One hundred forty-seven obsidian and 14 black non-volcanic glass artifacts with provenience information were recovered from the site. This includes one Late Archaic corner-notched dart point (black NVG), one late Late Prehistoric tri-notched point base, one probable Plains Side- notched point, one probable Prairie Side-notched point base, one unknown but probable Late Prehistoric point, several point performs, late stage biface fragments, one end scraper, several flake tools, one small (exhausted?) core, and flakes (Table 12). Two split pebbles were also recovered. The obsidian projectile points, including one corner-notched dart point made of non-volcanic glass sourced to the Powder River, Montana area are illustrated (Figure 7). Obsidian artifacts occur in all the depth increments except from 31-36 inches deep. The highest densities of obsidian occur from 0-12 inches and 43-48 inches deep. Black NVG artifacts occur primarily from 43-60 inches deep.

Table 8: Number of Cores by Percent of Remaining Cortex

RAW MATERIAL	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%
Cobbles	9	3	2	3	4	6	4	4	2	1
Dendritic agates	16	3	1	---	1	2	---	---	---	---
Quartz	19	---	---	---	---	1	---	---	1	---
Kremmling	1	1	1	---	1	1	---	---	---	---
Jasper	2	2	---	1	2	---	---	---	---	---
Metaquartzite	3	---	1	---	---	1	---	---	---	---
Bridger brown	---	---	---	---	---	---	1	---	---	---
Petrified wood	2	---	---	1	---	---	1	---	---	---
Red orthoquartzite	---	---	1	---	---	---	---	---	---	---
Zebra flint	3	1	---	---	---	---	---	---	---	---
Fossiliferous	---	1	---	---	---	---	---	---	---	---
Obsidian	1	---	---	---	---	---	---	---	---	---
Total NISP	**56**	**11**	**6**	**5**	**8**	**11**	**6**	**4**	**3**	**1**

The core (Figure 8) is small and has multiple

Table 9: Number of Flaked and Unmodified Wind Polished Pebbles by Depth (inches)

DEPTH	0-6	7-12	13-18	19-24	31-36	43-48	49-54	55-60
Flaked Pebbles								
Bridger Brown	1	6	---	1	---	2	2	---
Fossiliferous chert	1	---	---	---	---	---	---	---
Chalcedony	---	---	2	1	---	---	---	---
Petrified wood	---	---	---	---	1	---	---	1
Unmodified Pebbles								
Bridger Brown	1	1	1	1	---	---	---	---
Fossiliferous chert	1		1	1	---	1	---	---
Chalcedony	---	1	1	1	---	---	---	---
Total NISP	4	8	5	5	1	3	2	1

Table 10: Quartz Artifacts by Depth (inches), NISP

ARTIFACT	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Biface	1	1	---	---	---	---	1	4	---	---
Utilized flake	---	---	---	---	---	---	----	2	---	---
Core	1	4	1	---	---	---	---	4	1	---
Tested stream	---	---	---	1	---	---	---	1	---	---
cobble/pebble										1
Flake	74	75	29	19	19	12	22	159	9	8
Modified crystal	1	1	1	---	---	---	---	5	---	---
Unmodified crystal	---	1	---	---	---	---	---	6	---	---
Unmodified stream pebbles	---	2	---	---	---	---	---	1	---	---
Total NISP	77	84	31	20	19	12	23	182	10	9

Table 11: Quartz Rock Types by Depth (inches), NISP

ARTIFACT	0-6	7-12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60
Milk quartz	57	61	27	15	14	12	20	143	9	9
Rose quartz	2	4	1	---	1	---	---	12	---	---
Yellow quartz	---	---	---	---	1	---	---	---	---	---
Smokey gray/ black quartz	7	9	1	1	---	---	---	12	---	---
Clear quartz	11	10	2	4	3	---	3	15	1	---
Total NISP	77	84	31	20	19	12	23	182	10	9

narrow facets indicating the removal of almost bladelet-like flakes, although no blade-like obsidian flakes were found in the assemblage. All the point preforms are generally triangular and quite small and thin, likely intended for final manufacture into side-notched, tri-notched or unnotched Late Prehistoric arrow points.

The obsidian and black NVG artifact assemblage contains 133 flakes. Weights of the obsidian and black NVG flakes are presented (Table 13). Most of the debitage, nearly 89 percent, consists of small pressure and biface reduction flakes, weighing 1.5 grams or less, implying preference for the manufacture of small tools such as projectile points. There are several larger core reduction flakes, weighing from over 1.5 to 7.0 grams, suggesting at least a few relatively large pieces of obsidian were reduced on-site. Only one of the black NVG flakes retains any cortex.

The number of flakes with remaining cortex was also tabulated (Table 13). Two core reduction flakes have 85 and 70 percent remaining cortex. Other flakes with cortex are biface or core reduction flakes with 10-40 percent re-

Table 12: Obsidian and Black NVG Artifacts by Depth (inches), NISP

ARTIFACT	0-6	7-12	13-18	19-24	25-30	37-42	43-48	49-54	55-60
Obsidian									
Projectile point	1	5	1	---	---	---	---	---	---
Biface fragments	3	3	---	1	---	---	1	---	---
End Scraper	---	1	---	---	---	---	---	---	---
Flake tool	1	4	1	---	---	---	1	---	---
Core	---	1	---	---	---	---	---	---	---
Split pebble	---	---	---	---	---	---	2	---	---
Flake	17	23	11	8	6	6	50	---	---
Black NVG									
Projectile point	---	---	---	---	---	---	1	---	---
Flake	---	1	---	---	---	---	6	4	2
Total NISP	**22**	**38**	**13**	**9**	**6**	**6**	**61**	**4**	**2**

Figure 7: Obsidian and non-volcanic glass points, 48CR301 (A: NVG CN dart point, B: PRSN point, C: unknown LP point, D: PLSN tiny point, E: Tri-notched point).

Figure 8: Obsidian core from 48CR301.

maining cortex. While not many, these flakes suggest some minimally flaked and perhaps even unmodified pieces of obsidian were brought into the site. The obsidian flake retaining 70% cortex exhibits micro chipping along its dorsal ridge, possibly the result of minor abrasion during transportation.

Sourcing the Obsidian and Non-Volcanic Glass

Energy dispersive X-ray fluorescence analysis was performed by Geochemical Research Laboratory (Hughes 2013, 2014) on 83 specimens out of an assemblage of 161 items (Table 14). This constitutes a minimum 50 percent sample of obsidian and black NVG artifacts from nearly all excavated depths. X-ray fluorescence analyzes trace element content of obsidian and NVG artifacts as a signature of the source from which they were derived (Kunselman and Husted 1996:27). This is a non-destructive geochemical analysis, the parameters of which are summarized by Hughes (2007:231-232). Six additional black non-volcanic glass artifacts not submitted for geochemical analysis are also listed (Table 14).

There are eleven different sources for these artifacts from six different regions in the Rocky Mountain West. Sources include the Yellowstone area of northwestern Wyoming, eastern Idaho, southwestern Utah, northcentral Colorado,

Table 13: Obsidian and Black NVG flakes by weight and percent cortex

WEIGHT RANGE (GRAMS)	TOTAL NISP	NISP WITH CORTEX	NISP BY PERCENT CORTEX
0.015-0.10	25	0	----
0.11-0.50	56	3	1@10% 1@30% 1@40%
0.51-1.00	20	1	1@10%
1.01-1.50	17	3	1@10% 1@30% 1@40%
1.51-2.00	3	2	1@10% 1@85%
2.01-2.50	5	2	1@10% 1@70%
2.51-3.00	1	1	1@10%
3.01-3.50	1	1	1@20%
3.51-4.00	2	1	1@30%
4.01-4.50	1	1	1@10%
4.51-5.00	1	0	----
5.01-5.50	0	0	----
5.51-6.00	0	0	----
6.01-6.50	0	0	----
6.51-7.00	1	1	1@20%
Total NISP	133	----	----

Table 14: Source Areas of Obsidian and Black NVG Artifacts by Depth (inches), NISP

SOURCE	0-6	7-12	13-18	19-24	25-30	37-42	43-48	49-54	55-60
YELLOWSTONE									
Obsidian Cliff	6	2	1	2	---	---	3	---	1
Conant Creek	---	1	3	---	---	---	---	---	---
Lava Creek	---	1	---	---	---	---	---	---	---
EASTERN IDAHO									
Malad	3	6	2	3	2	3	16	---	---
Bear Gulch	---	2	---	---	---	---	---	---	---
Packsaddle Creek	---	---	---	---	---	---	2	---	---
SW UTAH									
Wild Horse Canyon	1	5	1	---	---	---	---	---	---
NC COLORADO									
La Poudre Pass	---	---	---	---	---	---	5	---	---
NC NEW MEXICO									
Cerro del Medio	---	---	---	---	---	---	1	---	---
Obsidian Ridge	1	---	---	---	---	---	---	---	---
SE MONTANA NVG									
Powder River (sourced)	---	1	---	---	---	---	3	2	1
Powder River (sight ID)*	---	---	---	---	---	---	4	2	---
UNKNOWN SOURCE	---	1	---	---	1	---	1	---	---
Total NISP	11	19	7	5	3	3	35	4	2

NVG=Non-Volcanic glass, SW=Southwest, SE=Southeast, NC=North-central.
*Included are six additional specimens of black NVG that are, based on sight identification, nearly identical to the sourced NVG specimens and are likely from the Powder River Montana source.

northcentral New Mexico, and southeastern Montana (black NVG). Estimated source distances from the Garrett Allen site are presented (Table 15) as well as references discussing the location and geologic context of each source area (Figure 9).

The most common source area is Malad, Idaho, represented by 39.3 percent of the assemblage. Obsidian from the Malad source occurs in nearly all depth increments, and is absent only from 49-60 inches below surface. Obsidian Cliff specimens are represented at the upper elevations and lowermost elevations, and constitute 16.8 percent of the sample. Obsidian artifacts from the Wild Horse Canyon, Conant Creek Tuff, Lava Creek Tuff, Bear Gulch, and New Mexico Obsidian Ridge sources occur in the upper elevations. The La Poudre Pass, Colorado obsidian pebbles occur in the 43-48 inch depth increment. The same is the case for the Packsaddle Creek, Idaho source, and the single artifact from Cerro del Medio, New Mexico. All the black NVG artifacts are from the Powder River, Montana source; most were recovered from 43-60 inches below surface with one specimen from 7-12 inches below surface.

These data indicate some variation in the use of obsidian and black NVG source areas over time. The clearest examples of this are the presence of the Wild Horse Canyon obsidian only from 0-18 inches below surface (probably spanning the Late Prehistoric period), the La Poudre Pass obsidian pebbles at 43-48 inches (probably dating to the early Late Archaic period), and most of the Powder River black NVG found from 43-60 inches (probably spanning the late Middle Archaic to early Late Archaic periods). Obsidian from the Malad and Obsidian Cliff sources appears to have been used across the prehistoric sequence at the site.

The highest number of obsidian and NVG specimens by depth occurs from 0-12 inches deep and 43-48 inches deep. Other depth increments have relatively few specimens. If the radiocarbon dates are indicative of the site as a whole, the 0-12 inch depth increment could date from roughly 500-800 years before present, or the middle to late Late Prehistoric period. Shoshonean Suite (Larson and Kornfeld 1994) diagnostic artifacts predominate at this depth. The 43-48 inch depth increment has been dated to 2363+/- 30 years BP, or the early part of the Late Archaic period. Pelican Lake/Elko corner-notched dart points make up most of diagnostics from this depth.

Comparing these two depth increments shows both contain relatively high diversity of obsidian sources. The Shannon diversity index (see Scheiber and Finley 2011:378) was used to calculate a numerical value of diversity. This index takes into account the commonness or rarity of each of the sources in a sample, as well as the relative abundance of each source; the higher the value, the greater the diversity within the sample. The Scheiber and Finley (2011) study examined nearly 2,300 obsidian artifacts from western Wyoming, Montana and Idaho from the Paleoindian to Protohistoric periods. For our purposes, only the southwestern Wyoming results from the Late Archaic and Later Prehistoric

Table 15: Source Area Estimated Distances from 48CR301 and Selected References

SOURCE AREA	APPROXIMATE DISTANCE FROM 48CR301 (MILES)	REFERENCE
Obsidian Cliff	300	Boyd, F. R. (1961)
Conant Creek Tuff	300	Christiansen and Love (1978); Christiansen (2001)
Lava Creek Tuff	300	O'Neill and Christiansen (2004)
Malad	280	Pope et al. (2001); Lang et al. (2007)
Bear Gulch	320	Hughes and Nelson (1987); Wright et al. (1990)
Packsaddle Creek	320	Kiilsgaard (1951); Kilburn (1964)
Wild Horse Canyon	420	Lipman et al. (1978)
La Poudre Pass (split pebbles and flakes)	90-100	Brunswig and Sellet (2010); Hughes (2005, 2006)
Cerro del Medio	400	Baugh and Nelson (1987)
Obsidian Ridge	400	Baugh and Nelson (1987)
Powder River (NVG)	240	Frison et al. (1968)

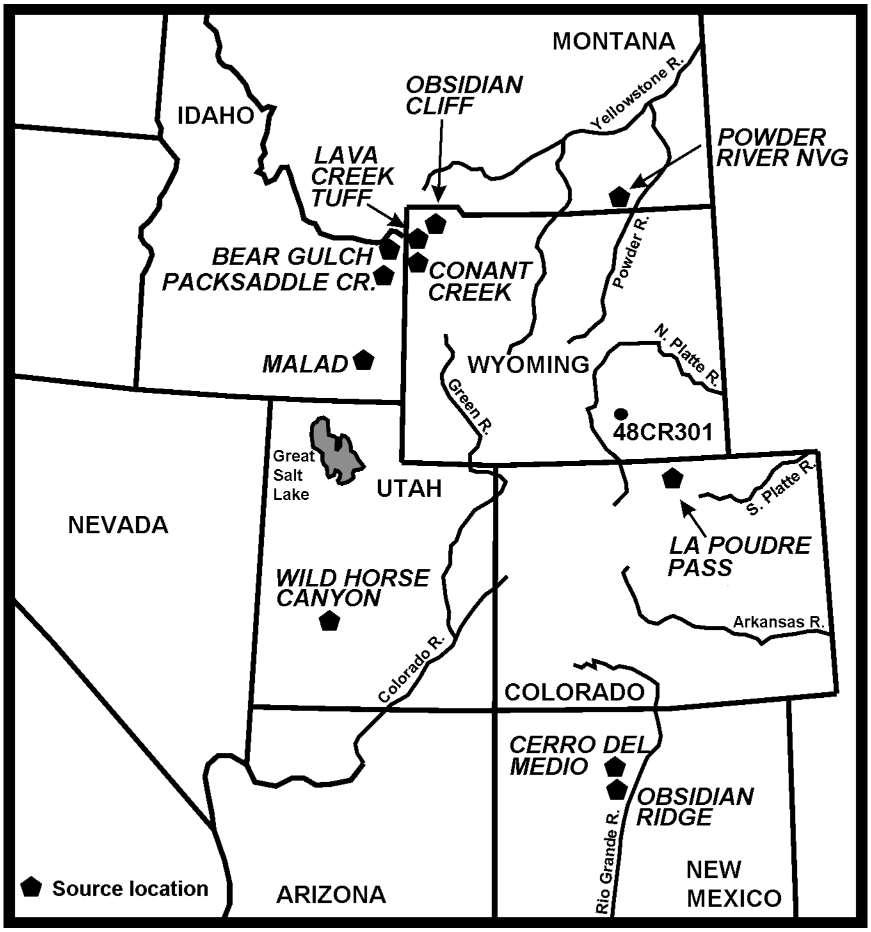


Figure 9: Map of obsidian and Black NVG source areas, 48CR301 artifacts.

were examined (Table 16). The diversity indices from the Garrett Allen site Late Prehistoric and Late Archaic samples compared to the same time periods in Scheiber and Finley (2011). As can be seen in the table, the diversity indices between the two are nearly identical.

These results are only suggestive of possible trends, given the previously discussed caveats regarding the difficulty in isolating dated components at the site. It is also the case the Garrett Allen sample at the 43-48 inch depth increment includes black NVG, a material not discussed in Scheiber and Finley (2011). If we assume the Garrett Allen obsidian data are reasonably reflective of the two time periods, they show a similar trend of peak diversity during the Late Archaic and into the Late Prehistoric period (Scheiber and Finley 2011:382).

Obsidian from other dated sites shows similar patterns. Late Prehistoric components at the Medicine Lodge Creek site in northcentral Wyoming show greater numbers of obsidian artifacts compared to earlier periods and high diversity of sources (Hughes 2007). Similar results were obtained by Wolfe and Frankus (2013), who examined obsidian artifacts from sites in southwestern Wyoming. Thompson and Pastor (1997) noted an increase in obsidian use in the Late Prehistoric period in the Wyoming Basin and increased use of Wright Creek (Malad) sources compared to earlier periods. A similar increase in Late Prehistoric obsidian use was reported by Bohn (2007) for the Upper Greybull River drainage area of northwestern Wyoming. A study of several site assemblages in northwestern Colorado and southwestern Wyoming (Lee and Metcalf 2011) showed high obsidian source diversity in the Late Prehistoric.

Table 16: Obsidian Source Diversity Comparison

	LATE PREHISTORIC	LATE ARCHAIC
Garret Allen Site	1.781	1.532
Southwestern Wyoming sample from Scheiber and Finley (2011)	1.778	1.424

On a larger geographic scale, Davis (1972) and Sutter and Young (2007) found increased obsidian use in the Late Archaic and Late Prehistoric periods compared to earlier Archaic and Paleoindian periods and the later Protohistoric period. A recent study discussing sites from most parts of Colorado and Wyoming showed obsidian source diversity is greatest during the Paleoindian, Late Archaic, and Late Prehistoric periods, and lowest during the Early Archaic, Middle Archaic, and Protohistoric/Historic periods (Wunderlich 2014:28).

Obsidian was an important prehistoric lithic raw material in Wyoming (Wunderlich 2014). The number of obsidian and black NVG artifacts from the Garrett Allen site and the diversity of source areas indicate considerable effort was undertaken to obtain and bring these materials into the site from distant source areas. This appears to have occurred through some kind of exchange process not yet fully understood. As Wunderlich (2014:44) suggested, the distribution and source diversity of obsidian artifacts in parts of Wyoming and Colorado may indicate established connections to other geographic regions and populations brought about by exchange.

DEBITAGE

Debitage was not always systematically collected (see Eckles 2013) during the 1969-1978 period. It appears in many cases flakes were simply not collected. In other cases, flakes were lumped into large depth increments, including flakes from combined levels. For example, there are bags of flakes from units with depth increments of 6-36 inches, 8-42 inches, 4-18 inches, etc. Obviously, these samples are not useful for the current analysis.

A cursory examination of all flakes with provenience information suggests high variation in the types of flakes produced and raw materials involved at any given location within the site (Table 17). For example, there are units in which most flakes are large, core reduction flakes consisting mostly of cobble raw materials. In other units, large numbers of biface reduction flakes are made from the more exotic raw materials. Many units contain the full range of core, biface and pressure reduction and include from a few to many different raw material varieties.

Debitage from the 1979-1980 excavations was collected, and there are sufficient records of the units and depths from which they were recovered. Guinard (2013) analyzed debitage from the 0-6 inch depth increment. He found somewhat more Morrison orthoquartzite compared to what was reported for the chipped stone tools at the same depth increment, but generally similar percentages of cobble raw materials, Zebra flint, Spanish Diggings orthoquartzite, Bridger Brown chert, and the red orthoquartzites. His analysis of the flakes indicated the more exotic raw materials arrived at the site as late-stage bifaces or formalized tools.

THE ARTIFACT CACHE

In 1974, Garrett Allen excavated several units in the upper northwestern quadrant of the site. This included units along the axis of the grid at 78N and 20W. In one of the units, 78N/21W, a cache of relatively large, minimally modified or unmodified chipped stone artifacts was found. The catalog card filled out by Mr. Allen states a cache of twenty-five artifacts was found in one location within the unit at 18 inches below surface. It turns out 34 artifacts were recorded at the location and cataloged under a single number representing the cache.

The cache contains 30 relatively large flakes and minimally chipped tools and four smaller

Table 17: Relative Frequencies of Raw Materials by Depth (inches), Flakes (selected units)

RAW MATERIAL	0-6	7-12	13-18	19-24	25-30	37-42	43-48	49-54	55-60
Cobbles	80 (48.5)	156 (60.7)	151 (57.2)	79 (56.0)	15 (62.5)	38 (48.1)	180 (59.6)	48 (48.5)	40 (63.4)
Red Orthoquartzite	6 (3.6)	10 (3.8)	12 (4.5)	3 (2.1)	---	---	---	---	---
Rawlins Uplift chert	3 (1.8)	---	1 (0.4)	5 (3.5)	1 (4.2)	1 (1.3)	---	1 (1.0)	---
Silicified shale	---	---	---	---	---	---	9(2.9)	7 (7.1)	---
Metaquartzite	---	1 (0.4)	6 (2.3)	4 (2.8)	---	---	---	---	---
Quartz	21 (12.7)	---	5 (1.9)	---	---	1 (1.3)	9 (2.9)	9 (9.1)	1 (1.6)
Kremmling chert	7 (4.2)	9 (3.5)	9(3.4)	4 (2.8)	6 (25.0)	8 (10.1)	8 (2.6)	3 (3.0)	3 (4.7)
Petrified wood	---	---	1 (0.4)	---	---	---	2 (0.6)	2 (2.0)	---
Dendritic agates	28 (16.9)	40 (15.6)	37 (14.0)	30 (21.3)	1 (4.2)	27 (34.2)	46 (15.2)	19 (19.2)	10 (15.8)
Spanish Diggings Orthoquartzite	3 (1.8)	4 (1.6)	4 (1.5)	1 (0.7)	---	---	3 (1.0)	---	---
Flat Top chalcedony	---	---	2 (0.8)	---	---	---	---	---	---
Jasper	2 (1.2)	5 (1.9)	18 (6.8)	12 (8.5)		2 (2.5)	19 (6.3)	3 (3.0)	3 (3.2)
Fossiliferous chert	---	2 (0.7)	1 (0.4)	1 (0.7)	---	---	---	---	---
Zebra Flint	6 (3.6)	18 (7.0)	7 (2.7)	1 (0.7)	1 (4.2)	---	7 (2.3)	---	3 (4.7)
Bridger chert	2 (1.2)	7 (2.7)	4 (1.5)	---	---	---	---	3 (3.0)	---
Clinker, Non-volcanic glass	5 (3.0)	4 (1.6)	5 (1.9)	---	---	---	14 (4.6)	4 (4.0)	4 (6.3)
Obsidian	2 (1.2)	1 (0.4)	1 (0.4)	---	---	2 (2.5)	5 (1.7)	---	---
Total NISP	165	267	264	141	24	79	302	99	63

flake tools. Nine of the large tools exhibit flaking on both sides of the proximal end, possibly preparation for the creation of a hafting element (Figure 10). These artifacts are similar in form to large end scrapers. The other 21 artifacts are large flakes with minimal or no retouch (Figure 11). The smaller artifacts attributed to the cache are all retouched flakes. In general, none of the tools exhibit extensive use wear or reworking from heavy usage.

Six different raw materials are present in the cache. They include dendritic agates, Zebra flint, fossiliferous chert, jasper, and an orthoquartzite and chalcedony likely derived from cobble sources near the site. Of the 34 artifacts, 70.5 percent are of dendritic agate, 17.6 percent are of Zebra flint and 2.9 percent each are of black fossiliferous chert, brown jasper, chalcedony and a fine grained orthoquartzite.

Eleven of the cache artifacts retain some amount of cortex, ranging from 10-50 percent of the dorsal surface. This includes nine dendritic agate specimens, one Zebra flint specimen and the chalcedony flake tool. Thus, some minimally flaked and perhaps even unmodified large pieces of these raw materials were brought into the site to makes these artifacts.

Direct dating of the cache was not attempted, and we do not have any information about its stratigraphic context so it could be correlated with dated soil horizons (Hayter 1981). Based on the recorded depth of 18 inches below surface, the age of the cache could fall between the radiocarbon dates of 920+/-110 (depth at 17 inches) and 1670+/-120 (depth at 22 inches). This assumes the radiocarbon dates necessarily apply to all below-surface elevations across the site. Given this caveat, it is likely the cache postdates the Middle Archaic and probably the Late Archaic, but where it fits into the chronology of the Late Prehistoric period (or end of the Late Archaic) is unknown.

SUMMARY

Lithic raw materials were brought into the Garrett Allen site from many parts of Wyoming and surrounding states. The site contains a high diversity of raw materials used in the manufacture of chipped stone artifacts. There are materials from distant source areas as well as river cobbles and pebbles likely gathered closer to the

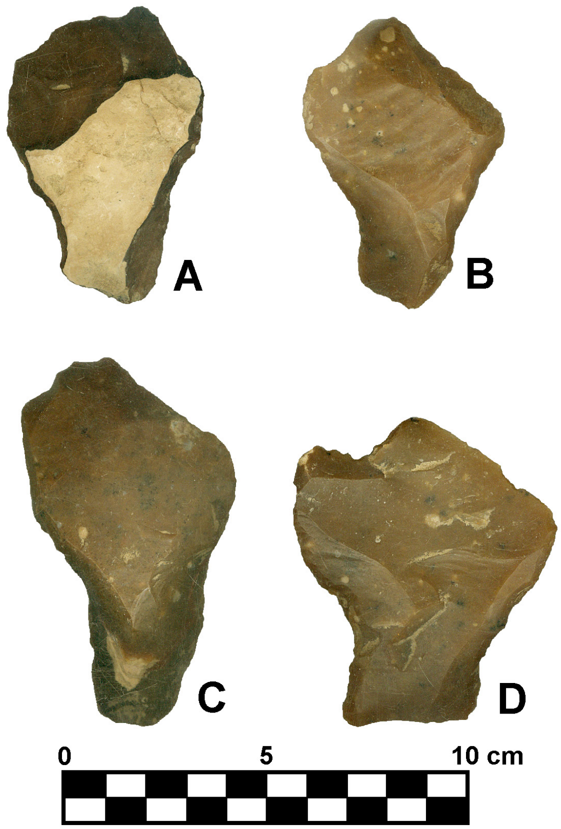


Figure 10: Selected cache artifacts with possible hafting elements.

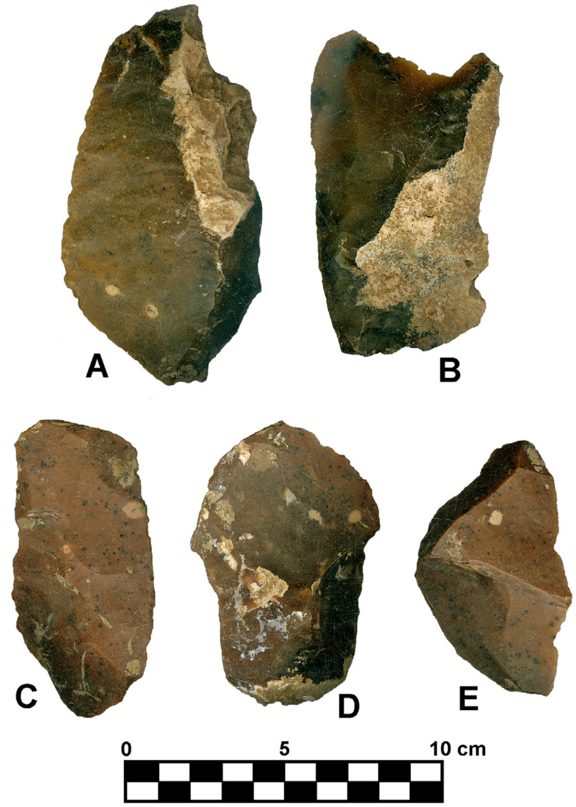


Figure 11: Selected cache artifacts, unmodified and minimally modified flakes.

site. While there is some variability in the relative frequencies of specific raw materials over time, there appears to be a general continuity in the percentages of the major materials used at the site throughout the excavated sequence. It would appear both "local" and "exotic" raw materials were brought into the site for similar purposes over the span of about 3100 years.

The following observations are noted:

1) Lithic raw materials were transported to the site from multiple distinct sources and multiple directions. This appears to be consistent throughout the excavated sequence. Distances involved are as close to the site as three miles (cobble source) to over 400 miles (several obsidian sources).
2) Large pieces of raw material were brought into the site, including river cobbles, but also, in lesser amounts, materials from distant sources. It would appear minimally processed and even unmodified pieces of tool stone were gathered and saved with the express purpose of bringing them to the Garrett Allen location. These materials were then processed at the site into a large variety of finished tools. Based on the core data above, the Guinard (2013) analysis, artifacts from the cache, and preliminary analysis of the chipped stone tools, the relative occurrence of large raw material pieces can be presented (Table 18). Most of the raw materials found closest to the site are in column 1, those of more moderate distances are in column 2 (with the possible exception of obsidian), and the most remote sources dominate column 3. It would appear as distance from the site increases, the amount of large pieces

of raw materials decreases in most cases. Even so, large pieces of Zebra flint and dendritic agates (which could have been procured as far away as the Hartville Uplift) are somewhat common in the assemblage. It would also appear the most remote sources provided mostly late stage bifaces and finished tools, supporting Guinard's (2013) conclusions.

3) The presence of the cache shows return to the site was anticipated. The co-occurrence of raw materials in the cache derived from widely separated geographic areas of Wyoming is intriguing; possibly suggesting different groups arrived at the site from different parts of the region for the purposes of interaction and exchange.
4) The presence of a relatively large number of quartz artifacts is perplexing. In fact, there are slightly more quartz artifacts (mostly flakes) than projectile points (complete and fragmentary). As with all the tool stone, quartz pieces were brought into the site for some reason. Most of the quartz does not appear to be suitable for making functional stone tools, with the implication the procurement and reduction of most quartz raw materials served purposes other than the manufacture of useable tools.
5) It has generally been assumed the presence of obsidian in a site so far away from the source areas is the result of a series of reciprocal exchanges and not from direct procurement. As distance from the obsidian source area increases, fewer and smaller pieces of the material are generally found in archaeological contexts (e.g. Smith 1999). This seems the most likely explanation for most of the Garrett Allen site obsidian, but there is some evidence large pieces of the stone were brought in and reduced for manufacture as if they had been more or less directly obtained from their source areas. The possibilities of direct procurement or exchange of large, minimally modified pieces of obsidian cannot be ruled out.
6) A great deal of tool manufacture occurred at the site. The diversity of chipped stone tools produced resembles a large residential occupation and this diversity appears to be present throughout the excavated sequence.

As previously discussed, well dated components have not been established. The coarse-grained analysis presented here identified elevation increments in which there are diagnostic artifacts which can be more or less separated by elevation. For example, the Shoshonean Suite (Larson and Kornfeld 1994) of diagnostics is generally found in the upper 12 inches of the deposits and the Pelican Lake/Elko dart points are found at depths from 24 to 60+ inches. Lithic raw materials for these diagnostics appear to be similar across the time periods with a few exceptions noted above. However, this is not the

Table 18: Relative Occurrence of Large Pieces of Raw Materials

HIGHEST OCCURRENCE OF LARGE PIECES	LOW OCCURRENCE OF LARGE PIECES	NO OCCURRENCE OF LARGE PIECES
Cobbles	Fossiliferous cherts	Flattop chalcedony
Dendritic agates	Bridger brown cherts	Morrison orthoquartzite
Jaspers	Petrified wood	Clinker/NVG
Quartz	Rawlins Uplift cherts	Spanish Diggings orthoquartzite
Kremmling cherts	Obsidian?	Basalt
Red orthoquartzites	----	Shale
Metaquartzites	----	----
Zebra flint	----	----

case for the Rose Spring corner-notched arrow points and Besant dart points. Raw material sources for the former are primarily from the southwestern and southcentral areas of Wyoming while Besant point sources are primarily from eastern Wyoming.

There may be, then, differences in the procurement and use of lithic raw materials over time, which has implications for the kind of occupations occurring. Perhaps large gatherings occurred only in some time spans, with more discrete occupations at other times. Data presented here only hint at these possibilities.

The diversity of artifacts and lithic raw materials has long been a subject of discussion regarding the Garrett Allen site. A prominent idea emerging over the years during and since the excavations is the site represents a series of large gatherings over time. Terms such as "rendezvous site," "trade center" (or "trade fair"), "special place aggregation," etc., have surfaced. One line of evidence for an aggregation site is the presence of lithic artifacts from multiple distinct sources and directions (Hofman 1994:354); the Garrett Allen chipped stone artifact assemblage clearly contains this kind of diversity.

> Regular or predictable aggregations of "rendezvous" at specific places have repeatedly been argued to be a key element of mobile hunting and gathering societies in order to facilitate alliances, exchanges of information, mate finding, education and indoctrination of the young, rites of passage rituals, and so forth. . . . It has also been suggested that fixed places on the landscape which have multiple key resources (e.g. water, wood, diverse species, quality lithics, and so forth) might facilitate repeated use for aggregate group gatherings and activities. . . . It is very likely that many items, including special or exotic items, would have changed hands during these encounters and would have moved across the landscape over an extended period of time through the actions of multiple groups and individuals. . . .(Hofman and Blackmar 2012:402).

The diversity of stone tools, diversity of lithic raw materials, presence of a large number of quartz artifacts, and indications large pieces of exotic raw materials were introduced, including, possibly, obsidian, suggest some kind of "special place" aggregation (see Hofman and Blackmar 2012:402). The Garrett Allen site is located around a perennial spring at the edge of the Medicine Bow Mountains and the edge of the Hanna/Carbon Basin, which is an ideal location given the presence of diverse animal species. It is also near sources of wood and useable stone from the nearby mountains and cobbles from the nearby drainages. While large gatherings may not have occurred during all the periods represented, the evidence points to some having occurred in the middle to late Late Prehistoric and early Late Archaic periods.

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LATEX MOLDS OF PETROGLYPHS AT LEGEND ROCK AND TORREY LAKE, WYOMING

Lawrence Loendorf and Bonnie Lawrence-Smith

In 2015, a document titled *BBHC Rock Art Project Phase I: Technicians Report* was discovered in the McCracken Research Library at the Buffalo Bill Center of the West. This document, never published, describes the making of latex molds at Wyoming petroglyphs sites. In the present article, we identify the individual petroglyphs molded during the project to alert others who might be studying the sites.

INTRODUCTION

In May and June 1987, the Buffalo Bill Historical Center (BBHC), now known as the Buffalo Bill Center of the West, undertook a project to make latex cast replicas of petroglyphs at the Legend Rock state petroglyph site (48HO4), the Torrey Creek/Whisky Basin site (48FR311), the Castle Gardens petroglyph site (48FR108), and other sites where they encountered images needed to fulfill the obligations of the grant. An example of the latter was horses, which they planned to cast at a site near Lander, Wyoming. George Horse Capture (BBHC) was the curator of the Plains Indian Museum at this time and the principal investigator for the project with the actual casting done by Nancy Jo and Steve Arthur from Rangeley, Colorado.

The project was not very successful. The main issue was the unpredictable nature of Wyoming spring-time weather. The researchers experienced rain, snow and cold, elements not conducive to the casting process which requires sunshine and warmth to cure the layers of latex between applications. They were able to make casts of 13 Legend Rock state petroglyph site figures and seven Torrey Creek/Whisky Basin petroglyphs. One of the Torrey Creek/Whisky Basin casts was damaged and could not be saved. Petroglyphs at Castle Gardens were not cast because of the inclement weather and an inability to access the site. Other sites were only photographed with no casting. In the project report, they state the figures they originally planned to cast included shields of Castle Gardens, horse figures, completely incised figures, bear figures, trapezoid-body shapes, astrological representations, round-body shapes, and completely abstract designs (Arthur 1987).

LATEX CAST PETROGLYPHS

In modern rock art research, the casting of petroglyphs is only practiced when there are no other alternatives to making good replicas of the images or in a situation where the rock art is about to be irreparably damaged or destroyed (Clottes et al. 1999). However, it should be clear this present article is not meant to demean or shame The Center or the Arthur's for their research project. Latex molds were accepted by many of the professional archaeologists of the time. The researchers were acting with permission from Wyoming State Parks for the Legend Rock work and the Wyoming State Game and Fish Commission for the Torrey Valley research under a Wyoming Humanities Council grant. They had also discussed the project with the Wyoming State Historic Preservation Office and the Wyoming

State Archaeologist.

In the 1970's and 1980s, the casting of petroglyphs was practiced across North America with the initial efforts using a variety of casting materials. Rapidly however, the most accepted technique was the use of latex compounds or making rubber molds (Brand 1974; Loendorf 1989). More recently, this technique has been criticized with the suggestion aluminum foil is less obtrusive (Bednarik 1990).

The usual explanation as to why researchers made casts of petroglyphs is they were preserving the petroglyphs. This is true in some cases but there are many examples where the petroglyph was damaged in the process. Sometimes the damage is apparent where the surface varnish was removed in the casting material. In some cases, the casting residue can be seen still adhering to the petroglyphs (Figure 1).

Equally important, however, is invisible damage to the rock surface because the casting can create problems with dating the petroglyphs. In a study done on the effects of various rock art recording techniques on cation-ratio dating, researchers learned the use latex peels made significant changes in the rock surface chemistry (Loendorf et a.l 1998). The cation-ratio age of the surface before the latex peel was 14,900 B.P.; two samples taken after the peel dated at 8, 300 B.P. and 36,700 B.P. (Loendorf 1989:162). The latter sample was from a chipped area in the surface, under the peel, and probably reflects the core stone rather than the surface. None the less, it is obvious latex peels can wreak havoc with cation-ration dating.

These problems were noted in the project to establish a rock art chronology (Francis et al. 1993) where pictograph and petroglyph sites in southern Montana and the Wyoming Bighorn Basin were studied. The Legend Rock site was especially important because it included the oldest weathering rind organic (WRO) dates, cation-ratio (CR) dates and varnish microlamination (VML) dates used to suggest a Paleoindian age for the Early Hunting style petroglyphs (Francis and Loendorf 2002). In fact, three figures, an outline anthropomorph, a fully pecked human hand, and a small, outlined quadruped were dated in excess of 10,000 years.

Other figures were dated by WRO/C14 to more recent ages. These dates were essential to setting up the cation-ration curve for CR dates.

LEGEND ROCK CAST PETROGLYPHS

The purpose of the present paper is to publish images of the Legend Rock and Torrey Lake/Whisky Basin figures cast during the latex casting project. Through this paper, we hope to alert others to the fact the varnish on the figures might be altered and thus not good candidates for any future dating projects.

The casting project was less successful in the Torrey Creek location, which Arthur also referred to as Whiskey Basin. The Boardman and Murdock families, on whose land several of the larger petroglyphs are located, did not give their permission for casting the figures. The same was true for the Ring Lake Ranch whose director at the time, Gary Keimig, denied access to the ranch petroglyphs for making latex molds.

The project leaders then requested and received permission to do the casting at panels on the state lands managed by Wyoming Game and Fish Department. In some ways, this permission is curious because the detrimental effects of casting were apparently known to Ring Lake Ranch and the Boardman—Murdock families but the fact the latex peels were made on public lands is helpful in determining where the casts were made. It limits the possibilities to the petroglyphs along the road to the west of Trail Lake.

In the notes for June 6, 1987, Arthur writes they photographed and made notes about the petroglyphs to be cast in the Torrey Valley. Unfortunately these photographs are not in the Buffalo Bill Center of the West files and an attempt to obtain them from Arthur was not successful. Although there are no photographs, there is a reproduction from one of the latex molds which can be used to assist in determining which figures were cast (Figure 15).

Arthur states the panels chosen for the casting were about two/tenths of a mile apart. Further she writes there were two sheep figures and five man/bird figures. There are only two or three sheep, in close proximity to each other, among the petroglyphs on the west side of Ring Lake which means the man/bird figure in the replicated cast is within a quarter mile of the sheep.

Trying to locate the sheep and man /bird combinations, it is possible to identify the panel cast with certainty and thereby narrow the location of the panels cast in the project (Figure 15). The birdman cast is found near other small bird-human combination figures which would suggest they were also part of the casting program. Arthur (1987:6) notes all of the figures were one to two feet in size so none of the major Torrey Lake figures were part of the program.

It may be possible to identify all of the panels in the field based on how clean they appear. Arthur notes after removing the latex from the Torrey Lake petroglyphs:

> "The rock cleaned up well but it took a long time as one of the one came off in pieces. We took none of the white/green lichen but it did raise some of the black" [Arthur 1987:8].

With this information it is clear future researchers should neither attempt to date nor study the rock varnish Torrey Lake petroglyphs within a half-mile of the sheep panels. The group of man/bird figures near the one in the cast (Figure 16) should also be avoided.

CONCLUSIONS

The purpose of this short paper is to make public the Center of the West casting program so future researchers who work with rock varnish at Legend Rock or in the Torrey Valley will know there are compromised surfaces. This is especially important for any varnish microlamination studies.

Overall the casting program was not successful. The main reason for this lack of success was weather which delayed and stopped the field team assigned to make the latex casts. "Do not mold when the temperature will drop below 32 degrees Fahrenheit" (Arthur 1976: 20). With the knowledge currently available about the damage done when casting petroglyphs, it is a good thing the weather was a deterrent.

Perhaps the worst outcome of the casting program was the lack of care for the latex molds after they were curated at the Center of the West. "The useful life of a mold depends on proper storage. With correct storage and proper use, they should last ten years" (Arthur 1976:21). By the time the report was discovered, the ten year period had come and gone.

Only three of the peels were made into the cast replicas of the petroglyphs they represented. The remaining peels were not kept in proper condition and after about 20 years, they were thrown away. This means the petroglyphs were compromised yet no replicated casts were made to show the results.

Fortunately the petroglyphs are still there and they can be photographed or studied by other measuring techniques. They cannot, however, serve as candidates for any studies involving the surface varnish.

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Figure 1: Casting residue on Castle Gardens shield panel. This likely represents a material pre-dating use of latex.

Figure 2: LRk 1 is the rabbit often referred to as the “Mimbres” rabbit prominently displayed at the east end of the main site. The rabbit was dated by WRO to 295 ± 55 B.P., an age used in set-ting up the cation-ratio curve for the regional chronology (Francis and Loendorf 2002:80). It was noted the chalk in the figure made it unsuitable for CR dating (Francis et al. 1993).

Figure 3: LRk 2 is the eagle/thunderbird and the small dog near its left foot in Panel 74. This fig-ure has had extensive chalking to the extent that most of the panel is not suitable for dating pro-jects (Francis and Loendorf 2002:106). One quadruped in the panel, how-ever, did yield CR age in the Early Archaic.

Figure 4: LRk 3 is the canid-like figure on the upper right of Panel 74. It was not part of the da-ting project at the site.

Figure 5: LRk 4 is a small anthropomorphic figure in Panel 73. It was not part of the dating program.

Figure 6: LRk 5 is another small rectangular-body anthropomorph with two small interior figures on its body. It is similar in size and form to LRk # 4. The figure on Panel 67 was not in the dating project.

Figure 7: LRk 6 is a well-made buffalo figure on Panel 48. It was not in the dating project.

Figure 8: LRk 6a – Elk petroglyph is immediately below LRk # 6 on Panel 48. It is apparently a deer with the same upraised front legs as LRk # 7, an elk below it. The figure in LRk # 6a has incised horns are oriented upward rather than back over its body like the elk. This suggests it may represent a deer. It was not used in the dating project.

Figure 9: LRk 9 – Elk petroglyph is a prominent elk on Panel 48. It was dated by CR to 2500 ± 350 B.P. The latex peel may have altered the age.

Figure 10: LRk 8 – pecked bison petroglyph on panel 35 is an outline bison on the bottom right of Panel 48. It is associated with another outline quadruped, probably a bison and an outline anthropomorph. These figures look much like the group dated to Paleo-Indian ages on Panel 35.

Figure 11: LRk 9 – This is the Bighorn sheep petroglyph on panel 18 with the “MC 1911” graffiti. The figure was not part of the dating program.

Figure 12: LRk 10 – Thunderbird/golden eagle petroglyph, panel 36, LRk 10 is an eagle/thunderbird figure on Panel 36. The figure is often noted in association with a modern eagle nest above it to the east. No samples were taken from this eagle/thunderbird for the dating program.

Figure 13: LRk 11 – Feline figure on panel 24 is one of the four or five linear figures at the site often associated with lions. Figure has a long body and straight legs but no claws. One of the other similar figures at the site does have claws which suggests it represents a lion; but there ae other possibilities. No samples were taken from this figure for the dating program.

Figure 14: LRk 12 – An anthropomorph on panel 10 is at the western end of the main Legend Rock panel. The panel includes a rectangular-body anthropomorph, a one-winged eagle/thunderbird and a partial quadruped. Apparently all of the figures were included in the latex peel. This panel had WARNING—NO TROJANS ALLOWED incised across it when it was cast in 1987. The figures were not used in the dating program.

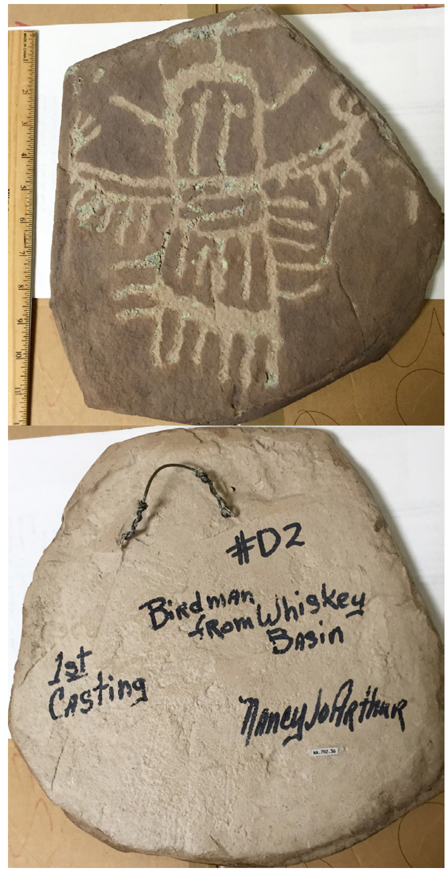

Figure 15: Plaster cast reproduction of Whiskey Basin Birdman made for the project and currently in the collections of the Buffalo Bill Center of the West.

Figure 16: Whisky Basin "Birdman," Torrey Valley petroglyph cast for the replica. Note the surface surrounding the bird-man figure more prominently shown on the left does not have much black lichen. This suggests it was also likely part of the casting program.

Figure 17: Whisky Basin Sheep panel near the latex cast “Birdman” in the Torrey Valley. Note the clean appearance of the sheep on the left with the arching horns over its back. The lack of surface lichen and varnish suggests it was part of the casting program.

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