MEMORANDUM OF AGREEMENT
BETWEEN THE
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT WINNEMUCCA DISTRICT OFFICE
AND THE
NEVADA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE
FLORIDA CANYON MINE
AMENDED PLAN OF OPERATIONS #18 PROJECT

WHEREAS, the United States Department of the Interior, Bureau of Land Management, Winnemucca District (BLM) plans to issue a Notice to Proceed to Florida Canyon Mining, Inc. (FCMI), a wholly owned subsidiary of Alio Gold, Inc., the owners of the Florida Canyon Mine, for the proposed expansion of existing mine facilities (hereinafter known as the Project) situated in Pershing County, Nevada, thereby making the Project and

WHEREAS, the BLM is the lead federal agency for the Project; and

WHEREAS, the Project will consist of an expansion of the Headwaters Pit (also referred to as the Switchback Pit and Radio Towers Pit), a heap leach pad expansion, a waste rock dump expansion, and realignment and development of access and haul roads (Full description in Appendix A); and

WHEREAS, the Project is an undertaking subject to review under the National Historic Preservation Act, codified at 54 U.S.C. § 306101 et seq., and its implementing regulations at 36 Code of Federal Regulations (CFR) § 800 et seq., and is a standalone undertaking unconnected to any other undertakings; and

WHEREAS, BLM has defined the Project's Area of Potential Effects (APE) as several discontiguous areas totaling 77 acres on public and private lands along the western slope of the Humboldt Range in Pershing County, Nevada, located in Township 32 North, Range 33 East, section 34, and Township 31 North, Range 33 East, sections 1 and 12 (Figures in Appendix A); and

WHEREAS, the BLM, in consultation with the Nevada State Historic Preservation Officer (SHPO), has determined that implementation of the Project will have a direct adverse effect on site 26PE2786/CrNV-02-6312, a prehistoric rock shelter and lithic scatter (hereinafter known as the historic property) which is eligible for listing in the National Register of Historic Places (NRHP) under the Secretary of Interior's Significance Criterion D; and

WHEREAS, in 2004 the BLM signed a Decision Record for the National Environmental Policy Act (NEPA) process authorizing the Project with the stipulation that the site be avoided or mitigated; and

WHEREAS, the Advisory Council on Historic Preservation (ACHP) has not been invited to participate in this undertaking because the BLM has determined that it does not meet the regulatory requirements for ACHP participation as stipulated in Component 5 of the 2012 *Programmatic Agreement Among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act*; and

WHEREAS, the BLM has notified Native American tribes in the area—the Lovelock Paiute Tribe and the Winnemucca Indian Colony—and has offered said tribes the opportunity to be concurring parties to this Memorandum of Agreement (MOA); and

WHEREAS, the BLM has coordinated public participation for this MOA through the process set forth in the NEPA process, and has determined that there are no interested members of the public who might have concerns regarding the effect of the Project on historic properties; and

WHEREAS, the BLM has consulted with FCMI regarding the effects of the Project on historic properties and has invited FCMI to sign this MOA as an invited signatory; and

WHEREAS, jointly the BLM, the SHPO, and FCMI will be called the signatories and individually as signatory or by their name; and

WHEREAS, the definitions given the 2014 State Protocol Agreement regarding the identification, evaluation, and treatment of historic properties on lands managed by the Nevada BLM are applicable throughout this MOA;

NOW, THEREFORE, it is mutually agreed by the signatories to this MOA that the Project will be implemented in accordance with the following stipulations in order to take into account the effects of the Project on the historic properties.

STIPULATIONS

BLM shall ensure that the following stipulations are implemented:

I. Historic Properties Treatment Plan (HPTP) Implementation

A. The BLM, in consultation with the SHPO, has developed a HPTP (Appendix B, Stoner and Cunnar 2018) for the historic property that cannot be avoided by the Project and will be adversely affected.

B. FCMI shall ensure completion of the HPTP and that a qualified (as determined by the BLM through the cultural resource use permitting process, in addition to, meeting the Secretary of the Interior's qualifications in archaeology) cultural resource management firm (hereinafter known as the cultural contractor) completes the treatments and data recovery as outlined in the HPTP.

C. The schedule for completion of HPTP tasks (Appendix B, Chapter 4) will be revised by FCMI and the cultural contractor, and approved by the BLM, to accurately reflect the start dates, weeks of fieldwork, archival research, and report completion. FCMI shall submit the revised schedule to the BLM for review and approval. If changes are needed after the start date due to any unforeseen circumstances associated with the Project and the schedule, the dates will be revised accordingly by FCMI and the cultural contractor and submitted to the BLM for review and approval by the BLM. The BLM shall provide the revised schedule to all signatories to this MOA and incorporate it into Appendix B. This revision will not require an amendment to the MOA per Stipulation V.

II. Progress Reports and Notices to Proceed

A. FCMI shall ensure that the cultural contractor provides progress reports to the BLM and FCMI as each task in the HPTP is completed. The BLM has five (5) business days to review and comment on the progress reports. The cultural contractor will address any comments raised by the BLM within five (5) days of receipt.

B. The BLM may issue Notices to Proceed (NTP) to FCMI after the BLM and the SHPO have had the opportunity to review the following to ensure conformance with the HPTP:

1. FCMI shall not begin any ground disturbing activity within the boundary of the historic property until the BLM issues a NTP.

2. FCMI shall ensure that the cultural contractor provides the BLM with a summary of the fieldwork (e.g., surface reconnaissance, photo-documentation, detailed mapping, and site recordation when appropriate) for the historic property after it is completed. FCMI shall ensure the fieldwork summary is submitted to the BLM within five (5) business days of completion of fieldwork.

3. BLM shall complete their review of the fieldwork summary within ten (10) business days of receipt. The BLM will determine if the fieldwork satisfies the requirements of the HPTP. FCMI shall ensure that the cultural contractor addresses any comments raised by the BLM within ten (10) business days of receipt and resubmit the field summary for BLM review.

4. BLM will forward to the SHPO the fieldwork summary and the BLM's intention to issue an NTP and request concurrence from the SHPO. The SHPO will complete their review within ten (10) business days.

5. If the SHPO identifies any concerns, the BLM will work with them to resolve the issues.

6. BLM will submit the updated and approved fieldwork summary to the SHPO.

7. If the SHPO does not respond within five (5) business days from date of receipt, the BLM may issue the NTP.

III. Discoveries

A. Inadvertent discoveries or unanticipated adverse effects to historic properties during implementation of the HPTP will be addressed in accordance with the process outlined in the HPTP. In the event that inadvertent discoveries are made, or unanticipated adverse effects are determined that cannot be addressed by the HPTP, then the processes outlined in 36 CFR § 800.13(b)(2) or the NAGPRA regulations at 43 CFR § 10.3 and 43 CFR § 10.4, as appropriate, will be implemented.

B. Human remains and associated grave goods discovered on private land will be handled according to the provisions of Nevada Revised Statutes 383. This MOA is intended to meet the terms found in NRS 383.121 as amended (Chapter 523, Statutes of Nevada 2017, page 3544) for an "existing agreement with a federal agency that was executed pursuant to federal law and that relates to the discovery of prehistoric native Indian human remains or a funerary object". Execution of this MOA means that the provisions for notification found in NRS 383.121, as amended, do not apply. Standard notification requirements found in NRS 383.150 to NRS 383.190, amended, do apply.

IV. Dispute Resolution

A. Should any signatory object to any proposed actions or to the manner in which the terms of this MOA are implemented, the BLM shall consult with the objecting party to resolve the objection. If either the objecting party or the BLM determines the objection cannot be resolved, the following actions may be taken:

1. The BLM shall forward all of the documentation relevant to the dispute to the ACHP. The ACHP shall provide the BLM and the objecting party its advice on resolution of the objection within 30 days of receipt of adequate documentation. Prior to reaching a final decision on the dispute, the BLM shall prepare a written response that takes into account the advice provided by the ACHP and any comments from signatories or concurring parties to this MOA. The BLM shall provide the written response to all signatories and concurring parties. The BLM shall then proceed according to its final decision.

2. If the ACHP does not provide advice regarding the dispute within 30 days, the BLM may make a final decision provided it has taken into account the comments provided by the signatories and concurring parties. The BLM shall provide all parties and ACHP with the final written decision and proceed accordingly.

3. BLM's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of a dispute will remain unchanged.

V. Amendments

A. This MOA may be amended with the written consent of the signatories. Any amendment will be effective on the date a copy is signed by all of the signatories. The BLM shall provide a copy to the ACHP.

VI. Termination

A. If any signatory to this MOA determines that its terms will not or cannot be carried out, that signatory shall immediately consult with the other signatories to attempt to develop an amendment per Stipulation V, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatory and invited signatory.

If the MOA is terminated, and prior to work continuing on the undertaking, the BLM must either (a) execute an MOA pursuant to 36 CFR § 800.6, or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. The BLM shall notify the signatories as to the course of action it will pursue.

VII. Duration

A. This MOA will become effective upon execution by the BLM and the SHPO, and will expire if its stipulations are not carried out within four (4) years from the date of full execution or unless it is terminated under Stipulation VI. At such time, and prior to work continuing on the Project, BLM shall either (a) execute a MOA pursuant to 36 CFR § 800.6, or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. Prior to such time, BLM may consult with the SHPO and FCMI to reconsider the terms of the MOA and amend it in accordance with Stipulation V. above. BLM shall notify the SHPO and FCMI as to the course of action it will pursue.

VIII. Execution

A. Execution of this MOA by the BLM and SHPO, and implementation of its terms evidence that the BLM has taken into account the effects of the Project on historic properties.

B. This MOA may be executed in counterparts, each of which shall constitute an original, and all of which shall constitute one and the same agreement.

[Remainder of page intentionally blank]

SIGNATORIES:

Department of the Interior, Bureau of Land Management, Winnemucca District

ACTING FOR 7/9/19

David Kampwerth, Humboldt River Field Manager Date:

Nevada State Historic Preservation Office

Rebecca L. Palmer 07/26/19

Rebecca L. Palmer, Nevada State Historic Preservation Officer Date:

INVITED SIGNATORY:

Florida Canyon Mining, Inc.

7/23/19

~~Joe Campbell,~~ Florida Canyon Mine General Manager Date:

Shana Blakeley

CONCURRING PARTIES:

Lovelock Paiute Tribe

Stephanie Rhodes, Chairwoman Date:

CONCURRING PARTIES:

Winnemucca Indian Colony

Judy Rojo, Chairwoman Date:

APPENDIX A:

PROJECT DESCRIPTION AND FIGURES

The Florida Canyon Mine Amended Plan of Operations #18 (the Project) is described below. The description is made up of direct quotes from the official Plan of Operations document submitted to the Bureau of Land Management (BLM) Winnemucca District by Florida Canyon Mining, Inc., (FCMI) with minor formatting and organizational changes by the BLM to increase readability.

Mining activities within the Florida Canyon Mine operations area have expanded periodically since production began in August 1986... Current mine facilities consists of a series of connected and satellite pits, waste rock dumps, a heap leach pad and associated processing plant, access and haul roads, and other ancillary facilities... There are approximately 5,522 acres within the current permit boundary and authorized disturbance (*previously authorized under the November 03, 2003 Minor Modification*) is 1,957.5 acres (1,034.1 acres of BLM-administered public lands and 923.4 acres of private lands)... All areas disturbed by FCMI since August 1986 remain active.

Under this Amended Plan of Operations, proposed activities (Headwaters Pit Expansion) would require a modification to the existing Plan of Operations Permit Boundary. The Plan of Operations Permit Boundary would be expanded on private lands by approximately 9.0 acres within the north half of Section 12, R31N, T33E. The boundary expansion would increase the total acres within the Plan of Operations Permit Boundary from to 5,522 acres to 5,531 acres.

Exploration activities and subsequent mine modeling have identified additional ore reserves adjoining and below the existing Headwaters Pit. This Amended Plan of Operations represents an additional 77.1 acres that would be disturbed by the proposed mine expansion, of which 24.0 and 53.1 acres are BLM-administered public lands and private lands, respectively.

FCMI proposes:

- expansion of the existing Headwaters Pit;
- expansion of the existing Headwaters Waste Rock Dump;
- expansion of the existing heap leach pad by addition to the North Heap Leach Pad area;
- re-alignment of the Section 34 Haul Road to facilitate the leach pad expansion;
- expansion the Plan of Operations Permit Boundary to facilitate the proposed Headwaters Pit development;
- access/haul road development through the Radio Tower West Pit backfill; and
- reduction of authorized exploration activities and disturbance.

<u>Headwaters Pit Expansion</u>
Exploration activities and subsequent mine modeling have identified additional ore reserves adjoining and below the existing Headwaters Pit. To facilitate extraction of the additional ore

reserves, expansion of the Headwaters Pit would essentially involve a pit highwall layback... Mining would be initiated from an upper elevation of approximately 6,250 feet and mined down to an ultimate bottom elevation of approximately 5,200 feet. Mining would generate approximately 15.0 to 20.0 million tons of ore and approximately 10.0 to 20.0 million tons of waste rock… Expansion of the Headwaters Pit would envelop approximately 95.8 additional acres, resulting in 44.3 acres of new land disturbance to both public and private lands, 15.5 acres and 28.8 acres, respectively. The remaining 51.5 acres encompassed by the pit expansion are existing mining related disturbances. Overall, the total pit disturbance would increase from approximately 33.3 acres to 129.1 acres.

Headwaters Dump Modification

The existing Headwaters Waste Rock Dump (not currently constructed) was designed to accommodate approximately 4.6 million tons and result in approximately 27.5 acres of disturbance to private lands... As proposed, the Headwaters Pit Expansion would encroach upon approximately 10.4 acres of area originally proposed for waste rock placement; therefore, reducing the surface disturbance to approximately 17.1 acres.

To facilitate additional waste rock placement, the Headwaters Waste Rock Dump would be expanded on private lands approximately 37.3 acres. This would provide placement for approximately 10.0 to 15.0 million tons of waste rock from the Headwaters Pit. Any additional waste rock generated from expansion of the Headwaters Pit would be placed either at the North Waste Rock Dump or as backfill into existing pits. Overall, the expanded Headwaters Waste Rock Dump would encompass a total of approximately 54.5 acres of private land. This would result in approximately 24.3 acres of new land disturbance to private lands. The remaining 13.0 acres encompassed by the waste rock dump are existing mining related disturbances.

Waste rock would be placed in approximately 50- to 100- foot lifts at the angle of repose with terraces between each lift. This would allow for contouring to the final 3H:1V reclamation slope. The stability of slopes in the dump would be maintained by constructing in lifts and recontouring during reclamation.

Heap Leach Pad Expansion

The existing 404 acre elliptical shaped heap leach pad consists of the original 238 acre circular pad, a 75 acre semi-circular leach pad addition, and a 91 acre north leach pad expansion... The total capacity of the heap leach pad is approximately 165.1 million tons of ore at an ultimate height of 300 feet.

In order to facilitate the additional ore placement resulting from the proposed Headwaters Pit Expansion, FCMI proposes to expand the existing 91 acre North Heap Leach Pad directly to the east. The proposed East Heap Leach Pad Expansion would occur entirely on BLM-administered public lands and increase the existing heap leach pad surface area by approximately 33.6 acres. However, only 8.3 acres of the pad expansion would occur as new disturbance and the reaming 25.3 acres would involve previously disturbed lands.

The heap leach pad expansion would have a capacity for approximately 20.0 million tons of ore when completed to a vertical height of 300 feet.

The proposed Heap Leach Pad Expansion has been designed in the same manner as the North Heap Leach Pad Expansion, and would consists of at least 1 foot of compacted (95 percent at optimum moisture) native alluvial material that achieves a hydraulic conductivity of 1x10-5 centimeters per second (cm/s) or lower, as required by NAC 445A.434. The low permeability soil layer, would be covered with a synthetic primary liner made of 80-mil thick, high density polyethylene (HDPE) geosynthetic membrane. The HDPE would then be covered with a minimum 3-foot protective cover layer of crushed ore material.

Section 34 Haul Road Re-alignment

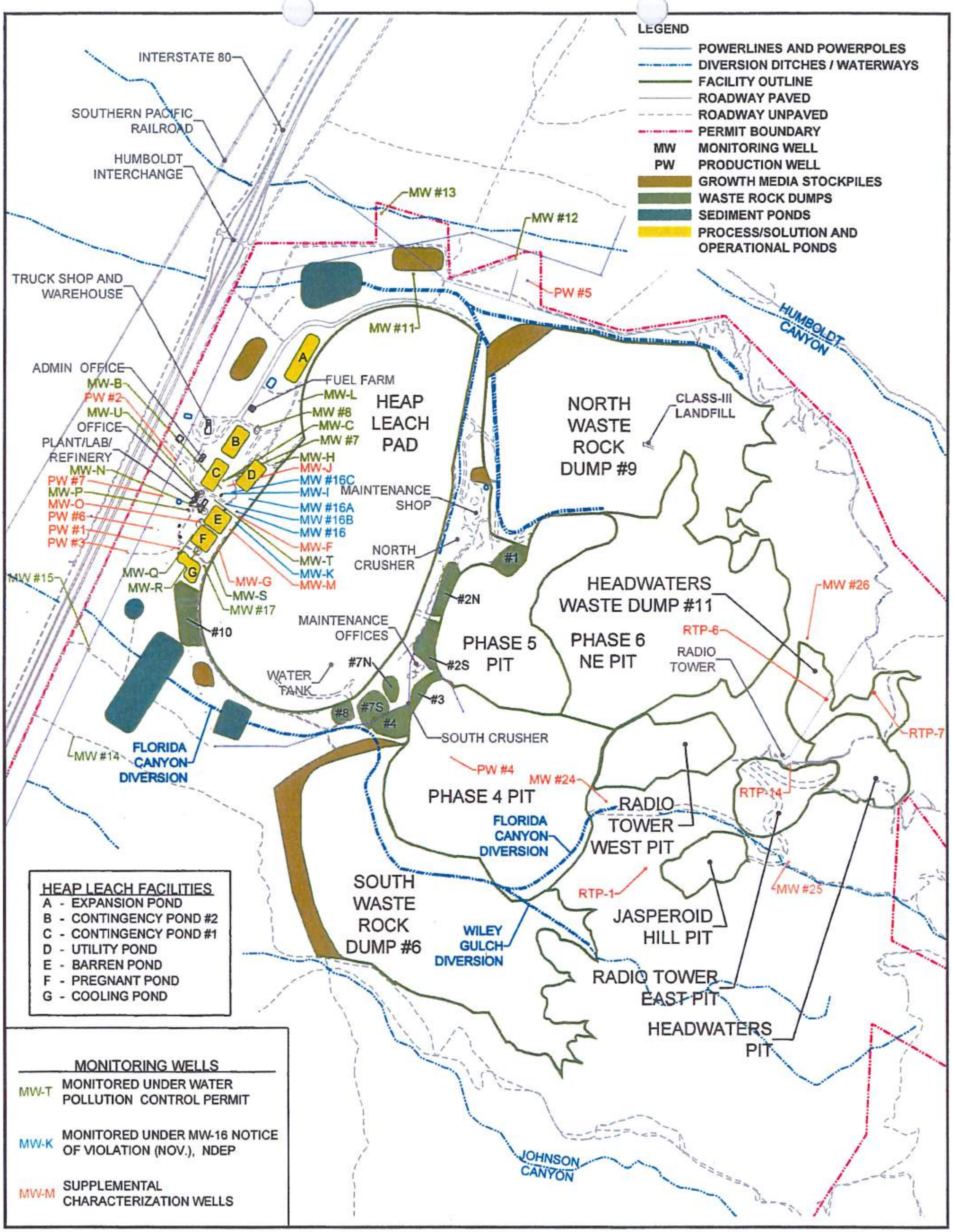
The proposed heap leach pad expansion would require a portion of the existing Section 34 Haul Road to be relocated. The haul road re-alignment would disturb approximately 0.2 acres of BLM-administered public lands. At the end of mining or when the haul road is no longer required, the road would be reclaimed by ripping the compacted surface as needed, pulling up as much of the fill slope as practical, and filling the cut slope to approximate the form of the land prior to disturbance. All culverts would be removed to restore natural drainage patterns. Water bars or other structures may be left in place to reduce any undue erosion. Suitable plant growth material would be spread (as required) and the area would be revegetated.

Haul Road Modification

Initially, to facilitate backfill placement of waste rock generated from the Headwaters Pit into the upper portion of the completed Radio Tower West Pit, an access/haul road approximately 360 feet long was constructed. The access/haul road (Radio Tower West Pit Access/Haul Road) resulted in approximately in 0.6 acres of disturbance to public lands and approximately 0.6 acres of disturbance to private lands.

To afford ore and waste hauls from the proposed Headwaters Pit Expansion, FCMI proposes to extend the access/haul road through the backfill material that was placed into the completed Radio Tower West Pit. The proposed access/haul road extension would be constructed approximately 5,800 feet long and have an average 70-foot-wide operating width. The access/haul road would encompass approximately 9.4 total acres (4.7 acres of public and 4.7 acres of private land).

At the end of mining or when the access/haul road is no longer required, the road would be reclaimed by re-contouring the backfill road material to a final 3H:1V reclamation slope.



HEAP LEACH FACILITIES

A - EXPANSION POND
B - CONTINGENCY POND #2
C - CONTINGENCY POND #1
D - UTILITY POND
E - BARREN POND
F - PREGNANT POND
G - COOLING POND

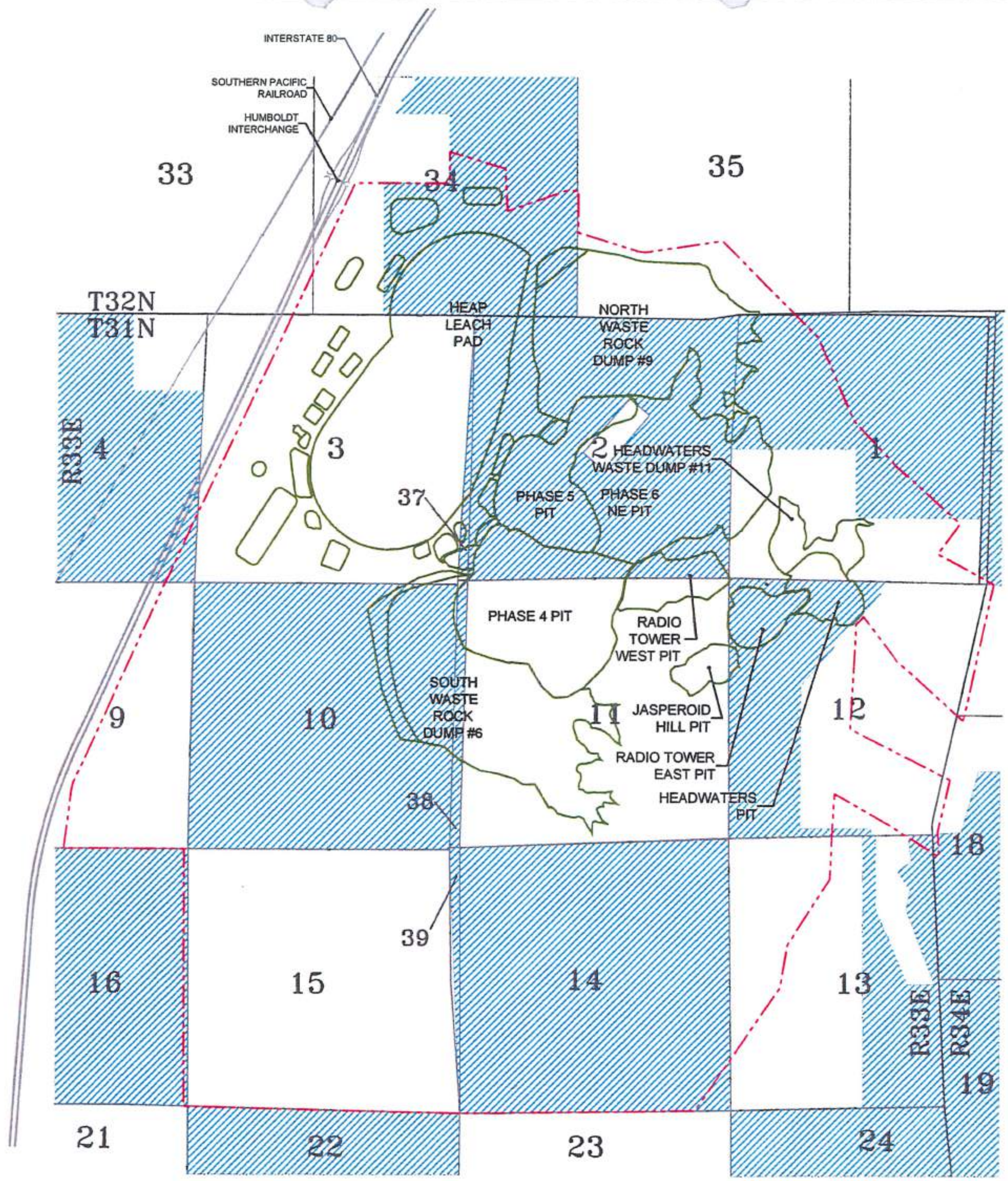
MONITORING WELLS

MW-T	MONITORED UNDER WATER POLLUTION CONTROL PERMIT
MW-K	MONITORED UNDER MW-16 NOTICE OF VIOLATION (NOV.), NDEP
MW-M	SUPPLEMENTAL CHARACTERIZATION WELLS

FIGURE 1-2
CURRENT MINE FACILITIES

DATE:	MAY 2004
PROJECT:	209108
TASK NUMBER:	1

01/29/04 P: \Projects\209-Florida Canyon\209108-AP018 EA\209108 AUTOCAD\209108 CURRENT FAC.DWG



LEGEND

PERMIT BOUNDARY

PUBLIC LAND ADMINISTERED BY THE BLM

PRIVATE PROPERTY

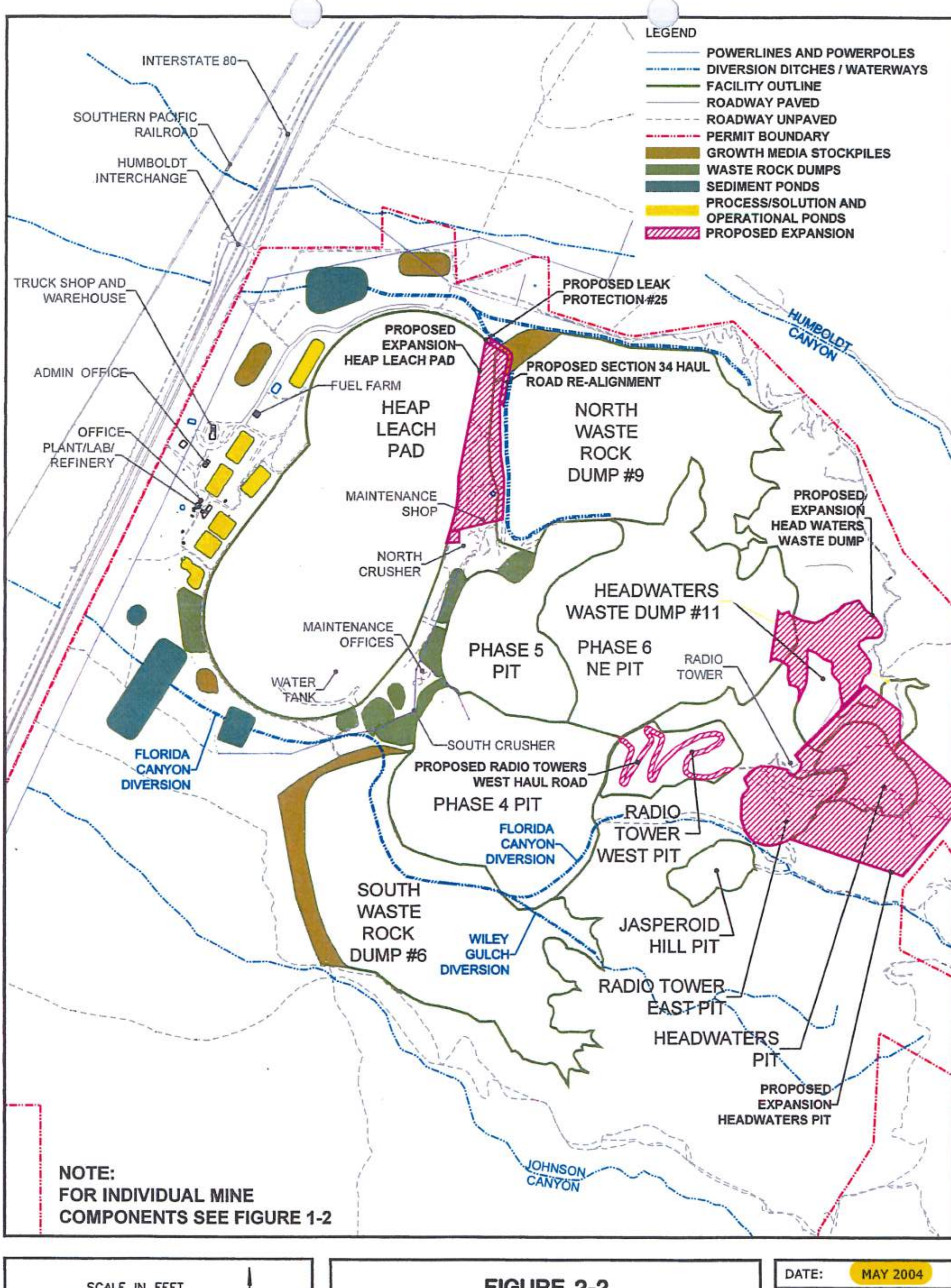
SCALE IN FEET 0 3000

N

FIGURE 2-1
SURFACE OWNERSHIP AND STATUS

DATE:	MAY 2004
PROJECT:	209108
TASK NUMBER:	1

03/26/04 P:\Projects\209-Florida Canyon\209108-APO18 EA\209108 AUTOCAD\209709 OWNERSHIP BOUNDARIES.dwg



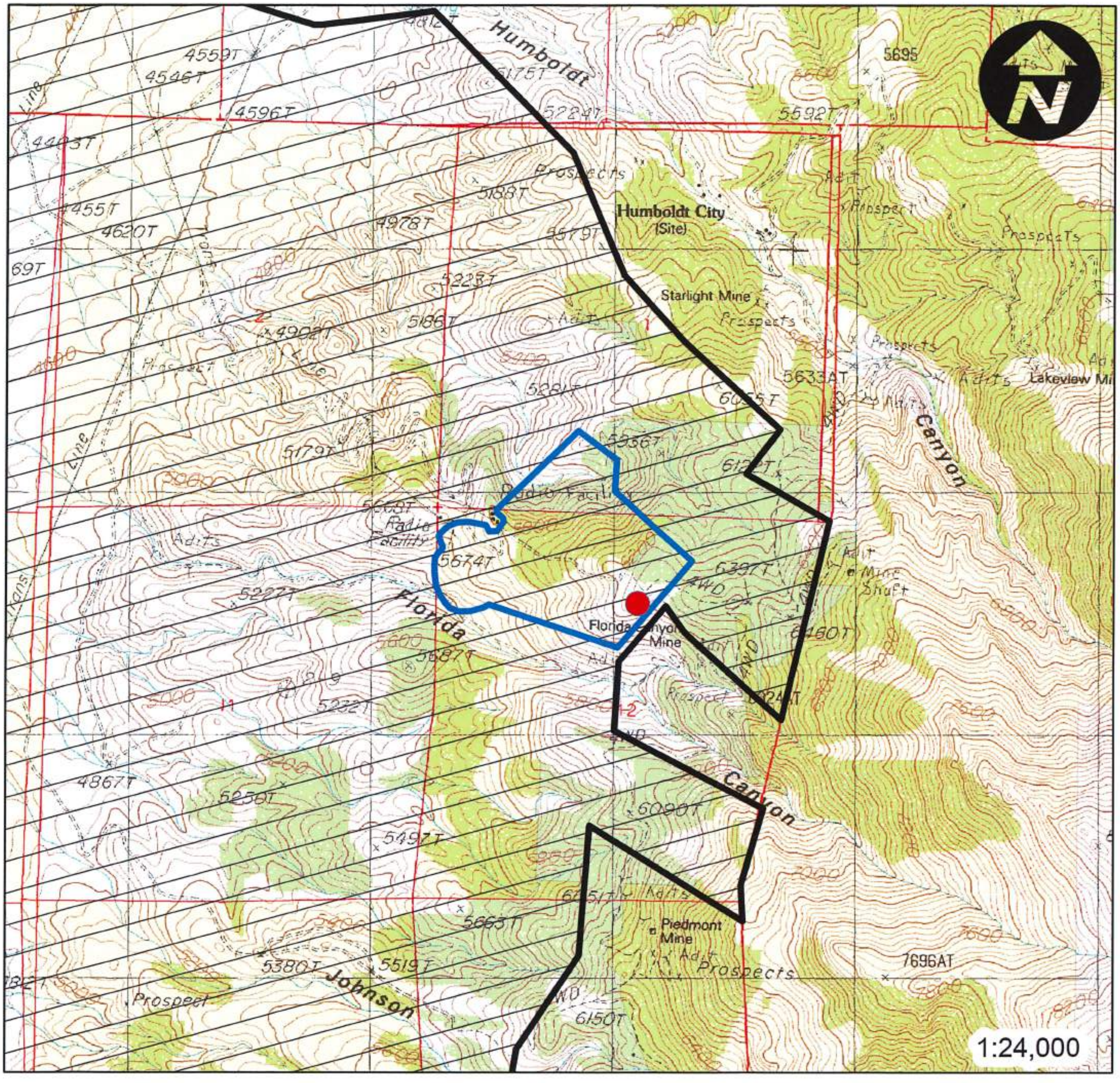
NOTE:
FOR INDIVIDUAL MINE COMPONENTS SEE FIGURE 1-2

FIGURE 2-2
PROPOSED MINE FACILITIES

DATE:	MAY 2004
PROJECT:	209108
TASK NUMBER:	1

02/16/04 P:\Projects\209-Florida Canyon\209108-AP018 EA\209108 AUTOCAD\290108 PROPOSED FAC.dwg

26Pe2786 and Florida Canyon APO #18 Pit Area



0 0.25 0.5 0.75 1 Miles

Legend

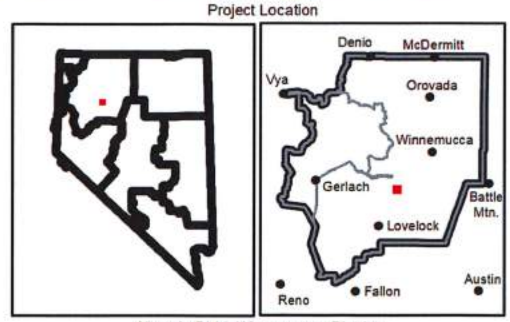
- 26Pe2786/CrNV-02-6312
- Florida Canyon APO #18 Headwaters/Radio Tower Pit
- Current Florida Canyon Plan of Operations Boundary

Land Status

Agency

- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Department of Energy
- Forest Service
- Fish and Wildlife Service
- National Parks Service
- Nevada State Lands
- Park
- Private
- Water

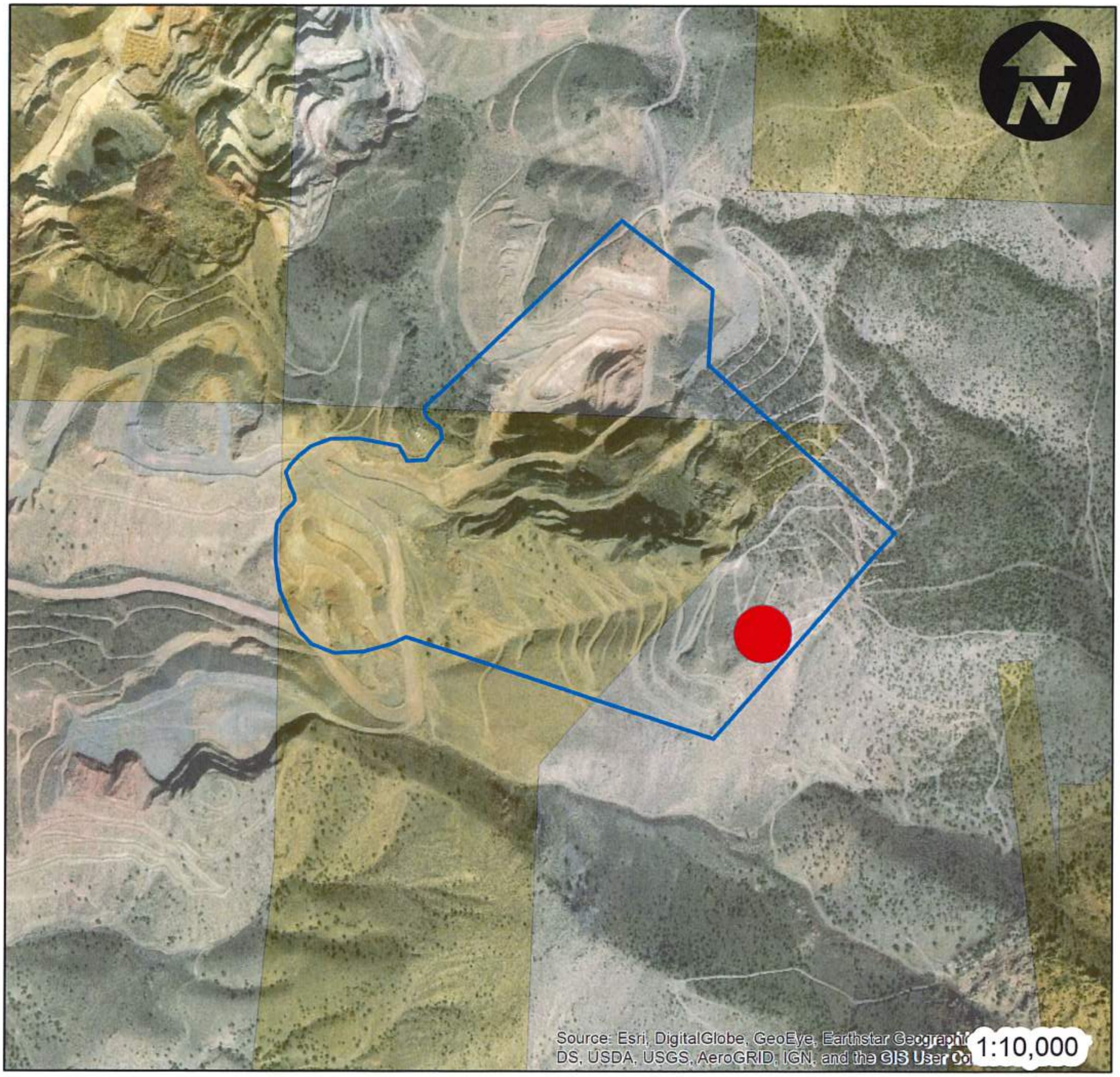
Project Location

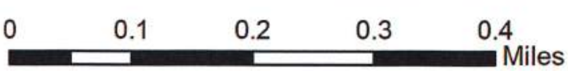


Nevada BLM, Winnemucca District

Date: 9/18/2018

26Pe2786 and Florida Canyon APO #18 Pit Area





Legend

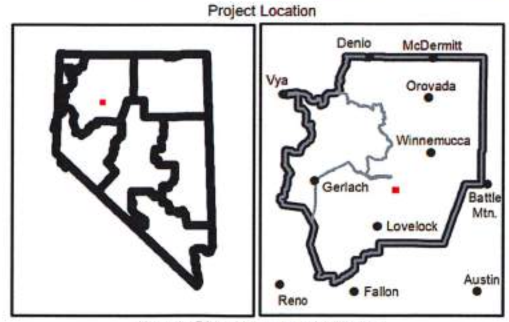
- 26Pe2786/CrNV-02-6312
- Florida Canyon APO #18 Headwaters/Radio Tower Pit

Land Status

Agency

- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- Department of Energy
- Forest Service
- Fish and Wildlife Service
- National Parks Service
- Nevada State Lands
- Park
- Private
- Water

Project Location



Nevada BLM, Winnemucca District

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Date: 5/22/2019

APPENDIX B:

HISTORIC PROPERTY TREATMENT PLAN

Prepared for
Florida Canyon Mining, Inc.
and
Bureau of Land Management

A Data Recovery Plan for Site 26PE2786 near the Florida Canyon Mining, Inc. Radio Tower Pit, Pershing County, Nevada

WCRM Report No. 18-R-001
BLM Report No. CR2-3408

November 28, 2018

Prepared by

W C R M

WESTERN CULTURAL RESOURCE MANAGEMENT, INC.

Under Contract With
Florida Canyon Mining, Inc.

A Data Recovery Plan for Site 26PE2786 near the Florida Canyon Mining, Inc. Radio Tower Pit, Pershing County, Nevada

Prepared by

Edward J. Stoner, M.A., RPA
and
Geoff Cunnar, Ph.D., RPA

Western Cultural Resource Management, Inc.
890 East Greg Street
Sparks, NV 89431

Thomas J. Lennon
Principal Investigator

Prepared for

Florida Canyon Mining, Inc.
P.O. Box 330
Imlay, NV 89419

Submitted to

Bureau of Land Management
Winnemucca District Office
5100 E. Winnemucca Blvd.
Winnemucca, Nevada 89445

BLM Cultural Resource Use Permit No. N-49643
WCRM Report No. 18-R-001
BLM Report No. CR2-3408

November 28, 2018

Table of Contents

List of Figures

List of Tables

Chapter 1. Introduction

In 1995 SWCA, Inc. conducted a Class III cultural resources inventory for the Florida Canyon Mine Study Area, in Pershing County, Nevada (Miller et al. 1996; BLM Report No. CR2-2689). The inventory resulted in the documentation of site CrNV-22-6312/26PE2786, a small southwest-facing rockshelter. The site is located on private land, part of a permitted mining activity on both public and private lands administered by the Bureau of Land Management (BLM) as a federal undertaking. It was determined eligible to the National Register of Historic Places (NRHP) under Criterion d. Site 26PE2786 will be subject to adverse effects as a result of the proposed expansion of the current Florida Canyon Mine Radio Tower Pit expansion and data recovery is proposed to mitigate adverse effect. Proposed treatment of the site includes data recovery through mapping, surface artifact collection, and excavation at site 26PE2786.

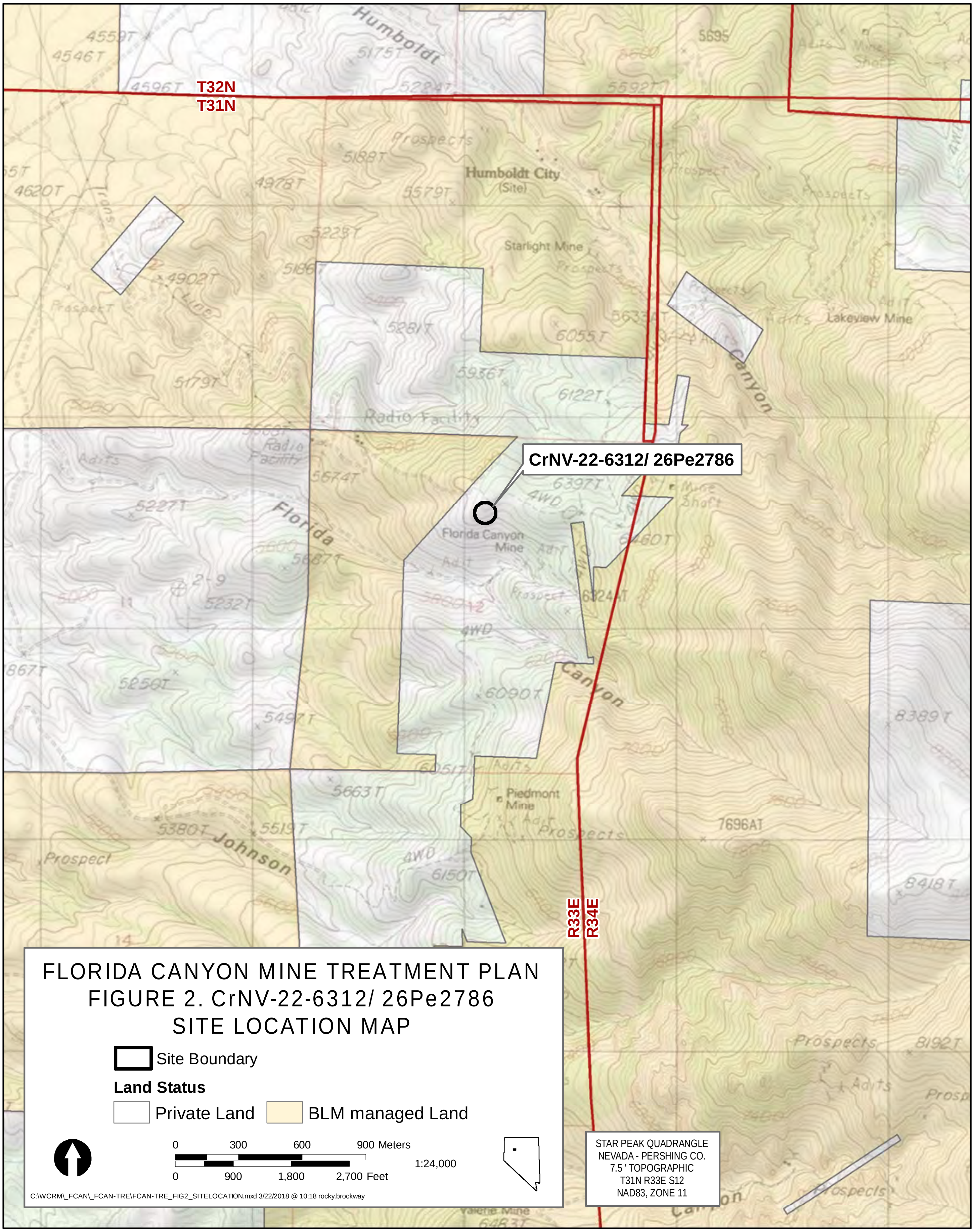
The Florida Canyon Mine is located immediately adjacent and to the east of Interstate Highway 80 (via exit 138) approximately 35-miles northeast of Lovelock in Pershing County and 42 miles southwest of Winnemucca in Humboldt County, Nevada (**Figure 1**). The site is located on the crest of a high ridge in the West Humboldt Range and is depicted on the Star Peak, Nevada USGS 7.5' quadrangle (**Figure 2**).

The goal of the data recovery plan (Plan) is to mitigate direct adverse effects from the proposed Florida Canyon Mine Radio Tower Pit expansion to site 26PE2786 in accordance with the National Historic Preservation Act (NHPA) 54 USC 300101 et seq. and 36 CFR §800.5(a)(1).

The Plan is organized so as to provide an introduction and background in Chapter 1. Chapter 2 follows with the environmental setting and a summary describing the site to be treated. Chapter 3 provides the research context of the plan which identifies and details the research domains considered important and in which appropriate research questions are posed, and data needs and expectations are described. Chapter 4 provides the treatment recommendations for the site. Chapter 5 presents the field, laboratory and archival research methods to be employed in the study. Chapter 6 presents key project personnel and their qualifications along with a proposed project schedule.

Three appendices provide support documentation. Appendix A provides the Intermountain Antiquities Computer System (IMACS) site documentation for the site to be treated, Appendix B contains resumes for key project personnel, and Appendix C contains WCRM's laboratory manuals.

FLORIDA CANYON MINING TREATMENT PLAN
FIGURE 1. PROJECT LOCATION MAP



FLORIDA CANYON MINE TREATMENT PLAN
FIGURE 2. CrNV-22-6312/ 26Pe2786
SITE LOCATION MAP

Chapter 2. Environmental Background

Environmental Setting

The site is located on a high ridge in the West Humboldt Mountain Range in Pershing County, Nevada. The site is located at 6,260 feet above mean sea level.

The climate in the project area is semi-arid. Based on a 118-year climate record for the weather station in Lovelock, Nevada, the average maximum temperature in the area 67.8 degrees Fahrenheit (F) and the average minimum temperature is 35.1 degrees F. The coldest monthly average temperature occurs in January at 17.7 degrees F and the average hottest month is July at 93.6 degrees F. The average annual precipitation is 5.29 inches, with an average snowfall of 7.5 inches (Western Regional Climate Center 2018).

Vegetation

The vegetation within the project area is characterized by an Upper Sonoran Community. It is primarily tall sagebrush (*Artemisia tridentata*) with Utah juniper (*Juniperus osteosperma*) occurring in the higher elevations. Other vegetation observed in the project area includes greasewood (*Sarcobatus vermiculatus*), budsage (*Artemisia spinescens*), rabbitbrush (*Chrysothamnus* spp.), and cheatgrass (*Bromus tectorum*).

Fauna

Large mammal species in the region include mountain lion (*Felis concolor*), Mountain Sheep (*Ovis canadensis nelson*), and mule deer (*Odocoileus hemionus hemionus*) (Hall 1995). Smaller mammals in the area include coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), badger (*Taxidea taxus*), Townsend's ground squirrel (*Spermophilus townsendii*), least chipmunk (*Eutamias minimus*), striped skunk (*Mephitis mephitis major*), packrat (*Neotoma cinerea*), desert cottontail rabbit (*Sylvilagus auduboni*), jackrabbit (*Lepus californicus*), and Great Basin pocket mouse (*Perognathus parvus*) (Hall 1995).

Common birds in the area are Brewer's blackbird (*Euphagus cyanocephalus*), raven (*Corvus corax*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), horned lark (*Eremophila alpestris*), and black-billed magpie (*Pica pica*) (Ross-Hauer 2008).

Common reptile species noted are desert horned lizard (*Phrynosoma platyrhinos*), gopher snake (*Pituophis catenifer*), Great Basin collared lizard (*Crotaphytu bicinctores*), and Great Basin rattlesnake (*Crotalus viridis*) (Mead and Bell 1994).

Geology, Geomorphology, and Soils

The site is located in the West Humboldt Range. The geology of this area is dominated by sedimentary and metasedimentary rocks including limestone and dolomite of the Upper Middle Triassic Natchez Pass formation Permian to Early Triassic rhyolite and andesite (Johnson 1977).

Site 26PE2786 is a small rockshelter and consists of a shallow niche formed in the bedrock on the hillside overlooking Florida Canyon. Rockshelter and cave sites have been intensively studied in the Great Basin because they may contain deposits with the potential to yield materials relevant to geologic, paleoclimate, and archaeological concerns (Thomas 1983; Heizer 1951, 1956; Loud and Harrington 1929; Schmitt and Madsen 2005). A number of natural processes affect rockshelters and can cause complex stratigraphic sequences to occur over time (Waters 1992). For example, sediments at the mouth of the rockshelter may be derived from mass movement of hillside materials, erosion of the rockshelter brow, and eolian transport very fine particles. In many cases, talus and colluvial materials from the rockshelter brow and the surrounding hillside form an apron downslope from the entrance of the shelter (Waters 1992). The amount of material is dependent on factors such as climate, slope, and local geology. Because of the complexity involved, the depositional environment of each cave and rockshelter is to some degree unique.

Soils near the site consist of Atlow-Wiskan association which are shallow and well-drained soils formed on residuum derived from chert, rhyolitic tuff, argillite, shale, mudstone, and sands (NRCS 1994). These soils are formed on the sides of mountains and Atlow series in particular are characteristically formed on south and west facing slopes. A typical soil profile consists of an A horizon up to 6 inches in depth followed by a Bt horizon that extends up to 9 inches further until bedrock is encountered.

Prehistoric Background

The Great Basin has been divided into various regions and subregions according to chronological sequences, environmental variables, and culture groups. The project area is within the Lahontan Basin subregion of the Western Great Basin (Elston 1986). Many professionals have studied the region in terms of past environments and their effect on prehistoric adaptive strategies. These adaptive strategies and changes in lifeways (e.g., technology and prehistoric land use patterns) are often discussed in terms of time periods such as Paleoarchaic, Early Archaic, Middle Archaic, Late Archaic, etc. Dates assigned to these classifications vary regionally. Below we have incorporated the results of previous investigations of various caves and rockshelters in the project region, including Lovelock Cave (Loud and Harrington 1929), Hidden Cave (Thomas 1985), Humboldt Cave (Heizer and Krieger 1956) and Leonard Rockshelter (Heizer 1951) amongst others. The excavation of these caves and the subsequent analysis of the material culture has allowed for the proposal of a phase sequence for the project region of the Great Basin.

The late Holocene layers uncovered at Lovelock cave and elsewhere and their associated material culture was termed the “Lovelock Culture” (Loud and Harrington 1929) which began around 4,000 cal BP (Grosscup 1960; Heizer 1951:Figure 43). Hallmarks of the Lovelock Culture are Wickerware basketry, Elko and Rosegate dart points, duck decoys, fish hooks, fish nets, net weights, feathered and coiled baskets, coiled water jugs and trays, horn sickles, zoomorphic figures, and L-shaped scapula awls (Adovasio 1974; Grosscup 1960; Heizer and Hester 1978; Heizer and Krieger 1956; Loud and Harrington 1929; Tuohy 1974). Several duck decoys were AMS radiocarbon dated to approximately 2000 BP (Tuohy and Napton 1986).

Grosscup’s (1960) report summarizes the chronological findings from the Lovelock Cave excavations earlier reported on by Loud and Harrington (1929). He suggests that the Early Lovelock Phase dates from 3950-2950 BP, the Transitional Phase from 2950-1951 BP, and the Late Phase from 1951-1050 BP Hattori (1982:17) reports that at Falcon Hill near Lake Winnemucca the Late Lovelock Phase along with Lovelock wickerware plaiting lasted until at least 580 BP

The excavation of caves such as Lovelock and Leonard allowed for the proposal of earlier cultures and phases (those preceding the Lovelock phase). These early occupation levels were assigned the “Leonard” and “Humboldt” culture (Heizer 1951). However, these early phases remain very poorly defined. Unfortunately, many of the early radiocarbon dates were derived from non-feature contexts such as bat guano and early excavation practices and looting events combine to further complicate reconstructing the regional chronology. Another problem is the scarcity of evidence for the Middle and early Holocene occupations. Because of these significant problems, we have chosen to incorporate the use of the chronological phases established at Gatecliff Shelter in the Monitor Valley in the central Great Basin (Thomas 1983). These phases are well-dated and appear to hold up at both at Hidden Cave where the occupations were determined to have been primarily in the Devil’s Gate and Reveille phase and in the surrounding region of Stillwater Marsh (Elston 1988; R. L. Kelly 2001; Thomas 1985). The phases and their associated date ranges are presented in Table 1. We have added the poorly defined “Leonard” and “Humboldt” phases in the middle to early Holocene. Below these phase sequences and their respective material culture are summarized.

Table 1. Phase sequences and ages for the project area.

Carson/Humboldt Sink Phase	Central Great Basin Phase	Age Range (cal BP)	Projectile Points
Paiute	Yankee Blade	650-100	Desert Side-notched, Cottonwood Triangular/Leaf Shaped
Late Lovelock	Underdown	1250-650	Rosegate
Transitional Lovelock	Reveille	3250-1250	Elko series
Early Lovelock	Devil's Gate	5000-3250	Humboldt, Gatecliff Split and Contracting Stem
Leonard	Clipper Gap	Ca. 6450-5000	? Large Side-notched
Humboldt	Grass Valley	Ca. 8000-6450	Pequop, Pinto?
Western Stemmed		14,000-8000	Western Stemmed series points

Paleoarchaic Western Stemmed: 14,000 - 7000 cal BP

The terminology for the time period prior to 7000 BP in the Great Basin is complex, with researchers preferring specific designations such as Paleoindian (Estes 2009; Goebel 2007; Tuohy 1974), Pre-Archaic (Elston 1986; Elston and Zeanah 2002; Smith 2006), and Paleoarchaic (Beck and Jones 1997; Willig 1989; Willig and Aikens 1988). The original term used to describe the period before the advent of notched points and ground stone, "Paleoindian," is used everywhere else in North America for these early populations but is often burdened by long-held assumptions regarding subsistence activities, primary among them the false notion that people relied nearly exclusively on megafauna such as mammoths.

Because of the perpetuation of this false assumption regarding subsistence, many researchers have decided instead to adopt less burdensome terminology, such as Paleoarchaic or Pre-Archaic (Haynes 2007). Elston (1986) indicated that early populations were vastly different from later Archaic populations in technology, settlement, and land use, and employed "Pre-Archaic" to emphasize those differences. The term "Paleoarchaic" on the other hand, could be interpreted as emphasizing the similarities many researchers have noted between early and later groups, including highly diverse subsistence remains associated with stemmed points recovered from cave deposits (Hockett 2007; Pinson 2007). We acknowledge that the terminology is not consistent in the literature, in this report, Paleoarchaic is preferred.

The Pleistocene epoch ended about 11,600 cal BP, following the Younger Dryas climatic event (Alley 2000). The last high stands of the pluvial lakes occurred during the terminal Pleistocene. Benson's research suggests that Lake Bonneville reached its high stand at ca. 18,500 BP at which point it began its gradual decline until between 14,700 and 13,100 BP when it rose to the Gilbert shoreline, possibly during the Younger Dryas, until falling again at 11,600 BP following the Younger Dryas (Benson, et al. 1992; Benson, et al. 2011). Proxies in the Lahontan Basin suggest that the lake reached a high stand at 14,500-13,000 (Benson 1978). The location of Western Stemmed point sites along the edges of these pluvial lakes has been well documented and led Bedwell (1970) to propose the name Western Pluvial Lakes Tradition for the complex of pluvial and riverine adaptations from Fort Rock, Oregon south to the edges of Lake Mojave, west to Lake Lahontan and the Sierras and east to Lake Bonneville.

There are numerous Paleoarchaic sites that cluster at shorelines around 1220-1225 m dating to the Younger Dryas period at around 12,900 cal BP which suggests that the Paleoarchaic inhabitants were focusing occupations along lake edges and marshes (Adams, et al. 2008). Proxy data from Owens Lake shows the Late Pleistocene high stand at 1160 m between ca. 24,000-23,700 cal BP. By 15,300 cal BP the lake was around 1145 m. This was followed by five major transgressions including a drop in lake level between 12,900-11,500 cal BP which corresponds to the Younger Dryas (Bacon, et al. 2006).

Evidence for Paleoarchaic and Paleoindian occupations of the Great Basin prior to 10,000 BP in terms of direct dates is rare, but our understanding of these early populations in the New World is progressing fairly rapidly. Radiocarbon dates and human DNA extracted from coprolites in Paisley Caves in Oregon suggests that humans first entered the Great Basin around 14,000 cal BP (Jenkins, et al. 2012). Phil Orr's 1950's excavations in Fishbone Cave in Nevada uncovered numerous ancient perishable artifacts including a Catlow mat which dated in excess of 9,000 BP, a cedar bark mat at ca. 13,000 BP, and a possibly human modified horse mandible dating to over 14,000 BP (Dansie and Jerrems 2005; Orr 1956; Rozaire 1974). Bryan's (1979) excavations at Smith Creek Cave in Nevada uncovered Paleoarchaic artifacts associated with scattered charcoal dating to ca. 13,500 BP In central eastern Nevada, a fluted point and a crescent were recovered from beneath a stratified layer dated to 10,340 ± 60 years BP (Beck and Jones 2009:72). Optically stimulated luminescence dating from Locus AR nearby Fire Creek in the Crescent Valley indicated that the Paleoarchaic deposits dated to the Younger Dryas period about 12,000 BP (Cunnar, et al. 2016; Cunnar, et al. 2015). In Sevier Basin in western Utah, numerous small sites containing stemmed points and crescents are located on top of the gravel channels that formed after 11,000 BP and prior to 9000 BP (Madsen, et al. 2015; Oviatt, et al. 2003:206). Archaeological evidence for early occupation in the region increases after 9000 BP (Beck and Jones 1997; Willig and Aikens 1988).

The Paleoarchaic toolkit is characterized by bifacial knives, concave and stemmed base projectile points, gravers, crescents, choppers, and scrapers, as well as the absence of ground stone (Beck and Jones 1997). Several unique tools including "slug" scrapers and centripetally flaked Levallois-like cores have been associated with the Paleoarchaic toolkit. Levallois-like reduction strategies have been reported from the Cooper's Ferry site in Idaho (Davis and Willis 2012; Davis, et al. 2012), at Locus AR nearby Fire Creek Nevada (Cunnar, et al. 2011; Cunnar, et al. 2015), and at Windust and Cascade phase sites along the Lower Snake River region in southeastern Washington (Muto 1976). At both Cooper's Ferry and Locus AR at Fire Creek one of the goals of the strategy was to produce large flake blanks for stemmed point construction.

Another artifact unique to the Paleoarchaic is the crescent, which is also commonly found at the location of ancient marsh environments. These tools are typically chert and are flaked into a crescent moon shape. While the function of these predominately chert tools is not known for certain, it is believed that they may have been used as blunt points to shoot gamebirds (Clewlow 1968; Lenzi 2015). Eugene Hattori et al. (1990) found protein residue suggestive of plant and animal processing. The combination of studies, suggests that the tools may have been multifunctional implements utilized to hunt and process waterfowl and potentially other resources.

The Paleoarchaic assemblages were highly curated and intentionally designed to maximize both tool use-life and design flexibility (Estes 2009; Graf 2001; Smith 2006, 2007), a practice that is absent in later chipped stone technologies (Goebel 2007). Paleoarchaic subsistence strategies were based on a high degree of mobility that maximized access to varying resources spread across the landscape and appear to have been focused near lacustrine resources and on upland game hunting.

Towards the end of the Paleoarchaic adaptation, the middle Holocene climate period (7500-5000 cal BP) arrived and the Great Basin region underwent a prolonged and harsh drying period. This ushered in significant changes in adaptive strategies. In the western region, the Truckee River ceased flowing for substantial periods of time, often hundreds of years. Lake Owens, located on the southwestern edge of the Great Basin, dropped and desiccated during this period, as did many of the pluvial lake systems (Benson et al. 2002:679). Textile dates from rockshelters in western Nevada confirm that rockshelters were not frequently inhabited during the middle Holocene (Benson et al. 2002:661). Small mammal populations dropped off sharply at Camels Back Cave and Homestead Cave in western Utah and pollen samples at Pyramid Lake, Nevada indicate the lake receded and xeric plants dominated (Mensing et al. 2004:33). These conditions continued through the beginning of the Archaic Period.

Early Archaic: Humboldt Phase also Grass Valley Phase (Monitor Valley Chronology): 8000 - 6450 BP

The Humboldt "Culture" was defined by very few artifacts recovered from Leonard Rockshelter and an associated radiocarbon date of about 7,900 cal BP obtained from a greasewood dart foreshaft. The artifacts included a leaf-shaped biface/preform, Olivella shell beads, dart foreshafts and a complete atlatl dart shaft (Heizer 1951:92-93). Unfortunately, no diagnostic projectile points were associated. Other nearby finds dating to this phase include various radiocarbon dated textiles from caves and shelter sites near Winnemucca Lake (Hattori 1982:Table 2).

Projectile points associated with this time frame include the split stemmed, robust, Pinto point. In the Lake Mohave region, Pinto points are thought to exist along with the Lake Mohave and Silver Lake stemmed points, but appear to last well into the Holocene (Beck and Jones 1997:195). A great deal of confusion has existed concerning distinguishing between the more gracile and recent Gatecliff split stemmed point from the more robust Pinto point (Hamilton 2012; Layton and Thomas 1979). Thomas' (1981) research in Monitor Valley, specifically Gatecliff Shelter, demonstrated that there was a more recent, more gracile, bifurcate, stemmed point called Gatecliff which was different than the older Pinto points found elsewhere in the Great Basin. The excavations at Gatecliff Shelter also demonstrated that these gracile split stemmed points were older than Elko series projectile points (Thomas 1983). Subsequently, Bryan Hockett demonstrated that the more gracile split-stemmed points were also older than Elko points in the eastern Great Basin (Hockett 1995).

Hamilton's (2012) research indicated that Pinto points and stemmed points were part of the same technological tradition and possibly contemporaneous. However, Beck and Jones (1997:195) point out that ground stone, which really becomes abundant around 8300 cal BP in the Great Basin, is prevalent at sites with Pinto points and is not a major part of the preceding Paleoarchaic tool kit. The shift from stemmed points to Pinto points is clearly seen in the Archaic horizons of North Creek Shelter (Bodily 2009). In summary, Pinto points appear to have their origins in the preceding Paleoarchaic phase, but also are prevalent at subsequent Archaic sites which are defined by a shift of adaptive strategies to more intensive collection and processing of plants.

Another newly proposed type of projectile point named "Pequop" also appears to be associated with the Early Archaic period. This new point type was recently recovered in well-dated contexts at both Long Canyon (Cunnar, et al. 2017) and Bonneville Estates Rockshelter (Hockett 2017). Four radiocarbon dates from site CrNV-11-18383/26Ek15282 placed a range on the age of the Pequop points at 6492-7936 cal BP. At Bonneville Estates Rockshelter, Pequop points were recovered from a deposit that was radiocarbon dated to 6200-7500 cal BP (Hockett 2017). Regionally, other Pequop points were present in the stratigraphy of Bob's Cave, Elephant Mountain Cave, Camel's Back Cave (Schmitt and Madsen 2005), Hogup Cave (Aikens 1970), O'Malley Shelter (D. D. Fowler, et al. 1973) and at excavations done at Brown's Bench in the late 1950's (Bower and Savage 1962). The hafting material on the Elephant Mountain Cave point was radiocarbon dated to 7727 ± 58 cal BP (AA-86303) (Smith, et al. 2013:Table 3). The Bob's Cave point hafting material dated to 7684 ± 103 cal BP (AA-92080) (Smith, et al. 2013:Table 3). We suspect that a combination of trying to "pigeon hole" markedly different types (i.e. Elko Side-notched) into the Elko point type and the very common issue of bioturbation in rockshelters and caves has resulted in the belief in an Elko "long chronology".

Early Archaic Leonard Phase (ca. 6450-5,000 cal BP) also Clipper Gap phase (Monitor Valley Chronology)

The Mid-Holocene climate continued to be probably the warmest and driest portion of the Holocene (Tausch, et al. 2004). Tree lines and vegetation increased in altitude while desert shrub increased their range (Mehringer and Wigand 1990; Wigand, et al. 1995). The Truckee River was not flowing during much of this period as Lake Tahoe was well below its rim (Benson, et al. 2002). Around 5800 BP the climate begins to ameliorate and the long drought ended with a significant period of increased summer rainfall, expansion of piñon pine cover, and a dramatic increase in artiodactyl density (Thomas 2014; Wigand 2010).

Heizer (1951) originally defined the Leonard "Culture" on the presence of one rod simple twined basketry and an associated burial and not the presence of a particular projectile point style as none were recovered. From excavation elsewhere in the Great Basin (Goebel 2007; Hockett 2015; O'Connell 1971, 1975; O'Connell and Inoway 1994; Schmitt and Madsen 2005), we now know that the Large Side-notched point is associated with the approximate time frame suggested as the Leonard phase. Thomas (1981:19) had encountered Large Side-notched points in Monitor Valley, but lacked any chronological data to attach them to his Monitor Valley Chronology. The scarcity of these points may indicate that the Central Great Basin was not heavily populated during the Mid-Holocene.

Northern Side-notched points are similar to Large Side-notched points, but have a distinctive comma-shaped notch and are believed to date between ca. 7,100-4,300 cal BP (Holmer 1986:104). O'Connell's stratified excavations in the Surprise Valley yielded a considerable number of diagnostic projectile points including Northern Side-notched points in stratigraphy that was radiocarbon dated to ca. 5,600-5,000 BP (O'Connell 1975). More recently, O'Connell and Inoway (1994) re-analyzed projectile points from the Surprise Valley excavations. Their results from the stratified "King's Dog Site" indicates that the Northern Side-notched points predate both Gatecliff and Elko series points. Northern Side-notched points appear to pre-date Large Side-notched points and at Camel's Back Cave fall within a range of ca. 6,200-4,650 cal BP (Schmitt and Madsen 2005:116) and in the northeast have been argued to post-date Gatecliff split stemmed points (Hockett 1995; Schmitt and Madsen 2005).

At Bonneville Estates Rockshelter Large Side-notched points span a considerable amount of time. This point type is the most prevalent dart form in Stratum 14 which dates between 7340-6690 cal BP (Goebel 2007; Graf 2007). Smith et al. (2013:Table 3) reported a direct date of 7162 ± 155 cal BP on the hafting material from a Large Side-notched point recovered from Bob's Cave.

The earliest occupations at the well-dated Gatecliff Shelter date to 6300-6050 cal BP and the occupants appear to have been very highly mobile hunters who were using Gatecliff Shelter as a logistical base camp (Thomas 1983, 2014). Hockett (2015:298) reports that the emergence of artiodactyl communal hunting occurred by 5800 cal BP at sites associated with Large Side-notch points such as Mount August, Cobre, Hill, Player Ridge and Excelsior in the western and north-central Great Basin.

Middle Archaic: Early Lovelock Phase/Devils Gate Phase (ca. 5000-3250 BP)

After about 6000 BP, the people that repopulated the Great Basin as the climate improved used a toolkit significantly different from that of earlier inhabitants. The climate brought cooler temperatures and increased effective moisture to the region. Ground stone appears regularly in the assemblages. A pack rat midden near Bodie Hills on the Dry Lakes Plateau, California, as well as data from Bodie Hills, show that pinyon was present in the area by 5000 BP and was well established by 4000 BP (Halford 2008:11). As piñon pine continued to spread north (Madsen 1999:80; Mensing et al. 2004:32), resources such as piñon nuts appeared more regularly in diets, while the focus of earlier inhabitants is thought to have been on larger game (Jones and Beck 1999:172).

Lovelock cave appears to have been first occupied around 4650 BP. Abundant artifacts from the Early Lovelock Culture (ca. 3950-2950 BP) were recovered from Lovelock Cave (Grosscup 1960:Figure 10). The Early and Transitional phases appear to have contained Elko series dart points as well as older Gatecliff split-stemmed points (Grosscup Type II), plain flexible twined basketry, hunting nets, and several Haliotis and Olivella ornament types, and throwing sticks.

In general, both Gatecliff series points and probably Humboldt points are indicative of this Middle Archaic time frame. Gatecliff points (originally interpreted to be Pinto) appear to have been found in abundance at the nearby Silent Snake Springs site (Layton and Thomas 1979). However, Kelly's research in the nearby Stillwater Marsh revealed very little evidence for use of the marsh during the Late Devil's Gate and Early Reveille phases (Early Lovelock Phase). During portions of the Post-Mid-Holocene Transition (5000-3500 cal BP) there was significant drought and many of the lakes in the Great Basin were desiccated (Benson, et al. 2002; Wigand and Rhode 2002).

Thomas (2014:137) points out there are numerous radiocarbon dates from this period and despite a probable shift to winter dominant precipitation patterns, logistical hunting seems to have thrived during this period and beginning around 4850 cal BP numerous Gatecliff projectile points are found in the mountains above the piñon-juniper zone indicating a probable focus on Bighorn sheep. There are also a number of large-scale traps and hunting features associated with this time frame (Hockett, et al. 2013). Thomas (1988:Chapter 5) documented a spectacular hunting trap complex located on Table Mountain. The alignments of low rock walls and hunting blinds are thought to have been used for the intensive harvesting of sage grouse. Both Humboldt and Gatecliff points were commonly associated with the complex.

Middle Archaic: Transitional Lovelock Phase/Reveille Phase (ca. 3250-1250 BP)

The Middle Archaic was a period of distinct changes in settlement and subsistence patterns, stylistic complexity and population density. Tool diversity increased, and informal local tool manufacture replaced the earlier, highly curated toolkit. Seasonal sites, especially winter camps, were used along the eastern Sierra Nevada and Carson fronts. Pit houses have been found at some winter sites and contained features such as hearths, burials and storage pits, supporting a pattern of continued seasonal exploitation within the same area (Elston 1986:142; Stoner et al. 2001; Stoner et al. 2006). While people remained mobile at least part of the year, the manufacture of lithic tools from locally occurring source material was the primary method of tool making. Some obsidian and marine shell trading continued across the Sierras (Elston 1986:142).

The period around 3000 cal BP is an interesting time period in the Great Basin. The Archaic period hunters are generally believed to have been highly mobile "travelers" (Bettinger and Baumhoff 1982) in search of highly ranked resources. However, there have now been six domestic structures investigated that date to this period. From south to north these include a Martis Phase house along the Carson River in Carson Valley at the Sunridge Site, one at Steamboat Hot Springs, and one along the Truckee River in Reno at the Daylight Site (Elston and Davis 1972; Stoner, et al. 2006; Stoner and Rusco 2001). Two are Lovelock Culture houses excavated at Tufa Village overlooking Honey Lake Valley northwest of Reno (Young, et al. 2009). The sixth one was a Lovelock Culture house overlooking the east arm of the Black Rock Desert and probably occupied by a Shaman (Cunnar and Stoner 2016). All six houses date to around 3000 cal BP This suggests that there may have been a period of semi-sedentary existence that corresponded to the relatively lush times of the Neoglacial period.

The improving climate conditions marginally increased the availability of plant and animal food sources on the valley floors. The use of ground stone for plant processing has been interpreted as evidence for an expanded diet during this period. The increasing reliance on local resources and the expanded diet breadth has also been interpreted as a response to increasing population pressure (Elston 1986).

Apparent Humboldt points (Grosscup Type I) were located in the Lovelock Transitional Phase. Also, in the Transitional phase at Lovelock Cave were perforated stones, snares, stone and clay balls, Catlow twined basketry, crude slate knives and Olivella oval beads (Grosscup 1960:57). Grosscup found that wicker basketry, snares, fine one-rod coiled basketry, intestine containers, sandals and possibly Rosegate arrow points were located in both Transitional and Late Lovelock phases (Grosscup 1960:57). This suggests that the bow and arrow was introduced during the Transitional period. The use of the bow with Rosegate arrow points continued into the Late Lovelock phase as did the construction of multiple-rod coiled basketry and duck decoys. Humboldt Cave also yielded numerous perishable items including wooden artifacts, bone and horn tools, textiles, and basketry that dated to the Transitional and Late Lovelock phases (Heizer and Krieger 1956). The oldest apparent cache of material dated to about 1900 cal BP (Heizer 1956:51).

Kelly suggested that the increase in the Stillwater Marsh site density during the Late Reveille and Early Underdown phases may indicate a reduction in residential mobility and a greater tethering to the marsh resources (R. L. Kelly 2001:296). The early Reveille phase overlaps with the Neoglacial Period (3500-2600 cal BP) during which time the Great Basin was much cooler and wetter (winter dominant) than the Post-Mid-Holocene Transition (Tausch, et al. 2004). The Neoglacial is followed by the Post-Neoglacial Drought (2600-1600 cal BP) during which precipitation levels dropped considerably which led to increased erosion brought on by decreased vegetation, reduction in lake levels, and alluvial fan growth (Benson, et al. 2002; Miller, et al. 2001; Tausch, et al. 2004). During this time, there is not abundant evidence for use of the Stillwater Marsh except for a few periods during which the Walker River contributed to the Carson Sink (R. L. Kelly 2001:Figure 10-1). Thomas has proposed a recent model in which he suggests that the Post Neoglacial Drought triggered an end to the period of logistical hunting in the Central Great Basin and a transition to family-based foraging and the occupation of high altitude sites such as Alta Toquima (Thomas 2014).

Elko points span 3300-1300 cal BP in the Central Great Basin. This span includes the Neoglacial and Post-Neoglacial drought so there presence alone cannot be used to understand the effect of these climate periods on occupations relative to one period or the other.

Particularly after 3500 BP, archaeological evidence shows a shift toward more sedentary site occupation along the eastern Sierra ranges. People used montane areas, valley floors, and lacustrine resources on a seasonal basis, and more concentrated living activities such as residential camps took place. Geochemical sourcing of the diagnostic tools from this period indicate that toolstone procurement was taking place at more localized sources, including the Bodie Hills and Mt. Hicks sources (Halford 2008; Keefe et al. 1999; Young and McCabe 2005).

Environmental conditions that favored the exploitation of higher elevation resources along the Sierra Nevada front (such as meadows) did not emerge until after 2800 BP (Ataman et al. 2001). Multiple ethnographies describe annual seasonal movement of the Washoe around the Lake Tahoe area (Bravo 1991; d'Azevedo 1986). Kelly (2001; Larson and Kelly 1995) and Livingston (1986) documented extensive cultural deposits throughout the Stillwater Marshes, such as house floors, human remains, and subsurface assemblages. Similar sites are documented in Carson Valley, where Stearns and Turner (1985) tested a mile-long prehistoric site along US-395 and found house pit features along with cultural deposits up to one meter deep.

Late Archaic: Late Lovelock Phase/Underdown Phase (ca. 1250-650 cal BP)

The Late Archaic commenced in the western Great Basin about 1500 BP and continued until European contact. Grosscup found that wicker basketry, snares, fine one-rod coiled basketry, intestine containers, sandals and possibly Rosegate arrow points were located in both Transitional and Late Lovelock phases (Grosscup 1960:57). This suggests that the bow and arrow was introduced during the Transitional period. Traits found only in the Late Lovelock phase included, carved stone art, boatstones, a possible wooden fish hook, a wooden pin, mats with cordage wefts, and blankets that were made with feather and fur cordage (Grosscup 1960:58). The use of the bow with Rosegate arrow points continued into the Late Lovelock phase as did the construction of multiple-rod coiled basketry and duck decoys. Elko series points could have overlapped with the production of arrow points meaning for some time both the atlatl and the bow and arrow were both being used (Thomas 1981).

The Post-Drought Transition and Medieval Warm Period (1600-650 cal BP) are the dominant climate periods during the phase. Relatively warm periods defined the climate regime and several significant drought events have been documented and argued to have contributed to the collapse of Anasazi and Fremont society (Benson, et al. 2007). However, during the Underdown phase there appears to be a significant increase in marsh setting sites around Stillwater Marsh and Kelly (2001:291-292) suggests that the "difference between foraging in the wetlands and foraging in other areas in the western Great Basin may have been at its greatest, and we could expect, therefore, to see at this time more intensive, possibly sedentary use of the wetlands, perhaps especially as a source of storable and on-the-shelf winter foods."

Whether the uptick in Rosegate projectile points in the Stillwater Marsh area signals an increase in use of the nearby lowlands or whether the uptick in arrow points signals an increase in population remains a significant research question. At some point in prehistory, the Numa (Numic language speakers) expanded from the region of California into the Great Basin. Using glottochronology Sydney Lamb proposed this event occurred at around 1000 BP (Lamb 1958). While there have been a number of proposals as to when and how this event happened (Aikens 1994; Bettinger 1994, 1999a, 1999b; Bettinger and Baumhoff 1982; Grayson 1994), it remains a significant and poorly understood research problem (Thomas 2016).

Terminal Prehistoric: Paiute/Yankee Blade Phase (650-100 cal BP)

The exploitation of locally available resources expanded and intensified and included a heavier reliance on plant resources and smaller game animals. The climate of the Little Ice Age was wet and cool and similar, but more variable than, the Neoglacial period (Tausch, et al. 2004). Changes included rises in lake levels in the Great Basin, lowering of tree lines and expansion of the marshlands and piñon-juniper woodlands across the Great Basin (Benson, et al. 2002; Lloyd and Graumlich 1997:1206, Figure 4; Mehringer and Wigand 1990; Wigand and Rhode 2002). During this period, Kelly suggests that both the site density and bioarchaeological studies from Stillwater Marsh indicate that the protohistoric groups were "tethered" to the wetlands with women spending their time gathering and carrying food at the wetlands while the men were logistical hunting (R. L. Kelly 2001:292).

Grosscup (1960) indicated that the historic Northern Paiute and the Late Lovelock phase shared two traits, the looped stirring stick and the wooden fire hearth. Other traits shared by the Lovelock sequence and the Northern Paiute were shredded fiber aprons (not in Transitional phase), mats, hoof pendants or rattles (not in Late Lovelock phase), nets, fur blankets, feather blankets (not in Late Lovelock phase), pointed wooden foreshafts, and slings (not in Transitional or Late phases) (Grosscup 1960:58). While grinding implements such as mortars, pestles, manos, and metates were not located within Lovelock Cave, Grosscup (Grosscup 1960:58) points out that they are plentiful on surface sites and were utilized by the Northern Paiute as well.

Diagnostic artifacts from this era include Cottonwood Triangular and Desert Side-notched points; the Terminal Archaic also saw an increase in ground stone use, and the appearance of Brownware pottery (Elston 1986:145).

Ethnographic Background

The project area is located within the boundaries of the traditional territories of the Northern Paiute. Historic ethnographic evidence for the Northern Paiute Indians (Fowler 1989; Fowler and Liljeblad 1986; Hattori and King 1985; Wheat 1967) indicates that the Northern Paiute were distributed across the Great Basin but consisted of numerous sub-groups that were politically and culturally distinct, sharing a common linguistic background. Their territory, as defined by their language, was bounded on the west by the Sierra Nevada Range, the Pit and Klamath watershed to the northwest, and on the north by the mountains dividing the Snake and Columbia drainages. The eastern edge commenced on the east side of Mono Lake, running northeast up through the Desatoya Range (see Bengston 2003:Figure 2.1; C. S. Fowler and Liljeblad 1986:435).

The Northern Paiute were semi-nomadic, seasonally exploiting resources within a particular area, then congregating in a larger group during winter encampments (Fowler and Liljeblad 1986:436). They overlapped territories with the Northern and Western Shoshone to the far east and north. To the west in the Virginia Range and the Pinenut Mountains, they overlapped areas with the Washoe. Both groups harvested nuts in these areas until the 1860s, when the massive timber harvests for the Comstock mines denuded the mountain slopes (Fowler and Liljeblad 1986:436). To the south lived the Owens Valley Paiute, who created a cohesive sociopolitical entity in their own right. Most groups returned to certain areas seasonally. Group names were often (but not always) terms based on food-names exploited by the group, but could also be altered to include place names and other resources (Bengston 2003:Table 2.1; Fowler and Liljeblad 1986:436).

The project area falls within the territories utilized by the Küpa-dökadö ("ground squirrel eaters") group (Bengston 2003:Figure 2.1, Table 2.1; Steward 1941:363). They were located near Lovelock and they occupied the Humboldt Sink region; their territory stretched 3600 square miles from Desatoya Mountain on the east, to the Nightingale and Selenite Mountains on the west, to the Pahsupp, Kamma, Majuba Mountains on the north, and the Humboldt and Hot Springs Mountains on the south (Stewart 1939:139-140).

The California Trail ran through the lands of the Küpadökadö, meaning they were one of the first bands to come into contact with Europeans. Fort McDermitt was also established nearby, meaning the band could take advantage of the food and clothing issued by the army (Stewart 1939:139). This proximity to European American settlers proved problematic, as members of Walker's 1834 exploration shot a Küpadökadö, "for the fun of seeing him fall," (Stewart 1939:139). This resulted in many of the Küpadökadö leaving the area; later travelers reported few or no sightings of them there for several years (Stewart 1939:139).

Tensions over land rights between settlers and the Northern Paiute peaked in 1860, during the uprising referred to as the Pyramid Lake War. Particularly after this time, the federal government actively sought to restrict the Northern Paiute to reservations, resulting in further loss of traditional subsistence and cultural territories. The situation continued to worsen over the next few decades. As white settlers continued to encroach on lands suitable for farming, ranching, and mining, natives were confined to smaller, less productive areas and forced to adjust to European culture and values to survive. The Indian Reorganization Act of 1934 at least provided some mechanisms to protect Native American properties; the act provided a framework for tribes to form their own governments and manage their tribal lands, which included preserving traditional cultural territories and practices.

The Northern Paiute language is Western Numic, derived from the Uto-Aztecan language family. The language noticeably varies between regions, particularly further north, although differences are not substantial enough to hinder communication (Fowler and Liljeblad 1986:435). There is still debate about the prehistoric origins of the Numic speakers, which will be briefly summarized from Elston (1986:145). Using glottochronology, Sydney Lamb (1958) proposed that the Numic speakers spread from California into the Great Basin around 1000 BP Although a number of archaeologists associate Late Archaic adaptive changes with this ethnic movement, a fair amount of controversy exists over when the movement actually occurred (Bettinger 1994; Bettinger and Baumhoff 1982; Madsen and Rhode 1994; Thomas 1994, 2016). The contrasting view is that the variation in the language supports an in-situ development over a longer period of time.

Caves and rockshelters served various purposes for the Northern Paiute. The burial practices Northern Paiute included wrapping the deceased in skins and placing the body in a rock crevice, cave or hillside grave. Personal possessions might be interred or in some cases they were burned at the internment location. Those suspected of being a witch could be burned upon death (Fowler and Liljeblad 1986:450; Stewart 1941).

Caves were also important places as they were utilized by Shaman as a source of power (Bengston 2003:108-110; Stewart 1941). Occasionally, Northern Paiute families utilized rockshelters and caves as homes (Bengston 2003:8; Heizer and Hester 1972:20; McGuckian 1996:38, 100). Caves were also occasionally used for other purposes such as shelter for horses (McGuckian 1996:100). Smaller rockshelters might be used for temporary camps (I. T. Kelly 1939:154). Caves also figure prominently in mythological stories of the Paiute (Steward 1936; Stewart 1939:140).

Chapter 3. Research Design

Introduction

Site 26PE2786 was recorded by SWCA, Inc. on August 18, 1995 and was described by Wenker (1995:1) as:

> "A small east facing rockshelter, situated high above Florida Canyon, containing three obsidian flakes at the modern surface and an obsidian flake at a depth of 10 cm below the modern ground surface which was located in a trowel test probes. The site is very small, but probably contains intact buried deposits".

Miller et al. (1996) describes the site on a high southeast facing ridge slope on the north side of Florida Canyon; however, it is actually southwest facing as depicted in the site map that accompanies the original documentation. The shelter is a small alcove at the base of a jagged outcropping of limestone. In front of the alcove is a stable talus pile that retains a small ledge in front of the shelter. The ledge has accumulated soils.

WCRM visited the site on November 22, 2017 with Mr. Matt Yacubic, a former BLM Humboldt River Field Office (HRFO) Archaeologist and found the site to be intact. It should be noted, however, that a low stacked stone wall was observed at the dripline of the shelter that apparently was not recorded by SWCA in 1995 or has been constructed since it was first recorded. Additionally, the rockshelter, which was described as east facing, was verified to actually face towards the southwest. SWCA noted three obsidian flakes on the surface of the site in 1995. WCRM and BLM did not note any flakes during the revisit to the site in 2016.

SWCA excavated two trowel test probes in the site. One of these was excavated at the dripline and as noted above, contained one obsidian flake at 10 cm below the ground surface (bgs). The second probe was placed inside of the shelter. No artifacts were covered from the second probe but it was noted that it went to 25 cm bgs and that "fill kept going". SWCA also noted that potential for intact deposits appears good, since no disturbances were evident.

The site was recommended eligible to the NRHP under Criterion d. Per Wenker (1995:1): "The site appears to contain intact buried deposits that may yield data pertinent to the comprehension of prehistoric lifeways, an issue identified in the research design for this survey" (BLM Report #CR2-2689 (P)). The BLM has determined the site eligible under Criterion d and the SHPO concurred on June 27, 1996 with the BLM's determination of eligibility for site PE2786.

Archaeological Property Type

Site 26PE2786 is a rockshelter and the remaining National Register values are found in the rockshelter deposits and possibly those deposits buried immediately outside of the shelter dripline. The trowel test probes excavated by SWCA in 1995 indicate the presence of subsurface artifacts and a sediment of depth of greater than 25 cm within the rockshelter. These deposits have the potential to yield additional cultural materials including features, artifact caches, and possibly perishables. Flaked stone artifacts, charcoal, and bone from the deposits inside and outside of this small rockshelter have potential to address research themes regarding Chronology and Geomorphology, Lithic Technology and Procurement, and Settlement and Subsistence Patterns discussed below.

Theoretical Perspectives

From the Late Pleistocene through most of the Holocene, the human populations of the Great Basin were hunter-gatherers. At open sites, flaked and ground stone tools along with production debris distributed on the surface or in shallow deposits dominate their archaeological legacy. With differing theoretical perspectives, methodologies and specific research questions, most Great Basin archaeologists try to learn about these past hunter-gatherers by studying flaked and ground stone technology and the distribution of archaeological artifacts and features on the landscape.

WCRM's approach is based on a set of widely held assumptions about the archaeological record, and therefore, research has focused on questions of most current interest to archaeologists concerned with not only the Great Basin's ancient populations, but comparable populations and causal factors resulting in cultural change around the world. We hold the position that there is no singly important overarching theoretical paradigm. Rather, we embrace the diversity of the archaeological record, embrace the diversity of theory and attempt to follow a pragmatic approach by asking "new kinds of questions from different vantage points and perspectives" (Preucel and Mrozowski 2010:34). To this end we generally employ aspects of various Social Theories including Cultural Ecology, Behavioral Ecology and Agency Theory in order to help "bridge" (M. B. Schiffer 2000) various theoretical paradigms while exploring multiple explanations for archaeological patterns without being doggedly committed to any one theoretical paradigm (Bamforth 2002). Specifically, we acknowledge that hunter gatherer groups have been the subject of much processual theory and we attempt to introduce some aspects of post-processualism into our interpretive thinking.

Our approach embraces technology as a social process through which individuals express their gender identities, negotiate power relations and produce tools symbolic of their beliefs, ritual and culture. For example, we at WCRM already know we can get down to the ***minutes*** when an experienced flintknapper interacted with a non-experienced flintknapper to make a particular tool type and hypothesize what the presence of children means for the groups adaptive strategies (Cunnar 2015). Another example would be inferring the presence of a shaman and associated ritual behavior by the nature of the artifact assemblage as was suggested at a 3,000 year old house in the Black Rock Desert (Cunnar and Stoner 2016). In both of these cases meaningful narratives could be constructed based on "daily life" (Hodder 2000:31).

In terms of methodology we argue that an engendered chaîne opératoire approach such as that advocated by Dobres (2000) has strong potential to bolster our understanding of social dynamics in the record. We have chosen a much broader social interpretation of the concept than that which is narrowly defined in American literature as "life history" (M. Schiffer 1975; Shott 2003). We operationalize the concept as originally defined that emphasizes the social context of agents and technology (see Delage 2017; Dobres 2000:Chapter 5; Leroi-Gourhan 1964, 1965). The goal of this research follows the broadly understood meaning of chaîne opératoire, which is to better understand the manufacturing process (Cresswell 1983; Sellet 1993). But, our definition of chaîne opératoire is the manufacturing sequence populated by agents within social settings and structures.

Research Themes

Based on the discussion above, our research design focuses on the following major themes.

Chronology and Geomorphology. Analysis under this theme will focus on dating the site deposits with a combination of recovery and identification of temporally diagnostic artifacts, testing of radiocarbon samples, and obsidian hydration analysis, in addition to any other data revealed during the fieldwork.

Lithic Technology and Lithic Procurement. The analysis of lithic data from the site deposits to explain how hunter-gatherers could have maximized the utility of toolstone available to them while minimizing associated risks, given different lithic technologies; raw material source identification, including obsidian sourcing and fine-grained volcanic rock (FGVR), to define the extended territory of prehistoric occupants, and

Settlement-Subsistence. The analysis of paleoenvironmental and subsistence data to further pattern definition for the periods during which the rockshelter was occupied.

Prehistoric Research Questions

In the development of a research design for the project we formed questions in all of the major categories of data the site may be expected to yield.

Chronology and Geomorphology

Chronological studies will focus on an attempt to identify stratigraphy through examination of profiles in excavation units. It may be possible to obtain absolute dates for strata using conventional radiometric technique or at the very least develop a relative chronology based on stratigraphy and temporally diagnostic artifacts. If large amounts of obsidian are present, it may also be possible to develop a relative chronology based on obsidian hydration studies.

An attempt will also be made to define period-specific components present at the site. Chronological data may be derived from the assay of radiocarbon samples, or identification of artifact styles previously shown to occur only in contexts that have been radiocarbon dated to the archaeological periods during which the site was occupied. Any typological study will be undertaken using established keys for the Great Basin and the general area (Holmer 1986; Thomas 1981) with reference to type descriptions and illustrations in the site literature. Intrasite distribution of point types, debitage and tools will be analyzed for patterns that may indicate period-specific components.

The following research questions are posed based on the above discussion:

Research Questions (Geomorphology and Chronology)

1. What is the possible absolute or relative time span of the site occupation(s) on the basis of stratigraphic or radiometric information from the site?

2. Does the project area fit into chronological sequences of the Western Great Basin and Lower Humboldt River Basin?

3. If the deposits on the site are stratified, are various strata related to datable single activities or do they represent techno-functional areas where a single activity, such as the caching of equipment occurred over time?

Data Needs: Question 1 requires appropriate in situ material for radiometric studies, the presence of projectile points or other artifact types that can be dated on the basis of their presence in radiometrically or stratigraphically dated contexts. Obsidian artifacts and/or geomorphologically or radiocarbon dated cultural deposits are required to address all questions.

The dates that can be assigned to components on the basis of chronometric data independent of the relative dating of projectile points present on the sites offer one approach to this problem. Any stratified deposits will play an important role in the consideration of these questions. The comparison of artifact distribution in relation to present and earlier environmental parameters with comparable data sets from other Western Great Basin and Lower Humboldt River Basin sites is another potential data base from which to approach the problem. Technological studies can be expected to yield data relevant to Questions 2 and 3 as well.

Data Expectations: While rockshelters and caves are more likely than open-air sites to contain stratified deposits with organic material suitable for radiometric assay, Site 26PE2786 is a relatively small shelter and such materials are expected to be minimally present if at all. The surface and subsurface obsidian artifacts noted in the site documentation indicate that there is potential for additional obsidian artifacts to be present. If present, a sample of obsidian may be sourced and subject to hydration.

Lithic Technology and Procurement

Our technological studies have three major goals. The first goal is to seek answers to questions raised by the regional lithic terrane and lithic production sequences represented at the site in order to see the economic consequences of variability in the organization of lithic technology during the occupation periods represented.

A major objective of the first goal is to identify the kinds, geochemical composition and source of stone raw materials. Another objective is to estimate the availability of appropriate lithic raw materials in the "lithic landscape or terrane" (*sensu* Gould 1980:123, as discussed by Elston and Raven 1992:35; Andrefsky 1994) in order to estimate constraints that tool procurement strategies may have exercised on foraging behavior.

The second goal is to reconstruct subsistence practices utilizing a techno-functional approach to analysis. This objective can be achieved by employing various methods to derive site function from stone tool assemblages (Andrefsky 1998). Such methods include the examination of lithic tool morphologies and typologies, assemblage composition and diversity, and examination of use-wear traces on stone tools.

The third goal is to explore the social processes involved in the production of stone tools. In order to accomplish the third goal, we employ social theory as discussed above to enhance current theoretical perspectives used by Great Basin archaeologists to explain hunter-gatherer behavior such as cultural and behavioral ecology and optimal foraging models (Kelly 2001).

Examination of core reduction techniques have been used to differentiate between assemblages produced by different site occupants (Fagan 1988; Tuohy 1970). If there is evidence for core reduction on the site, analysis of the artifacts may suggest relationships with sites in the surrounding area and region. Core and flake types and sizes will be recorded to determine technologic trajectories, knapper skill levels (including novices and children), and assemblage variability.

Methods and analytical strategies to be employed are influenced by several studies in the Great Basin (Ataman and Bloomer 1992; Bloomer et al. 1992; Elston and Budy 1990; Elston and Raven 1992; Fagan 1988; Moore 1992; Moore and Young 1992; Rusco and Davis 1987; Wheeler et al. 1992) and elsewhere (Andrefsky 1994; Flenniken 1985; Goodyear 1974, 1979, 1993; Sassaman 1992; Torrence 1986).

On the basis of this background, the following questions will guide the lithic analysis.

Research Questions (Lithic Technology and Procurement)

4. What type(s) of cores and core reduction occurred on the site? What was the intended product? Was a specific form of flake, blade, or flake blank the desired end product? Do these remains suggest continuity of use?

5. What stages of biface manufacture are present on the site? What technological trajectories produced these bifaces? How does this assemblage compare with other sites in the region?

6. How do the use of particular lithic sources and concomitant lithic reduction sequences identified by our study compare to those from other analyzed assemblages both from nearby, and more distant

regions? What kinds of lithic procurement (Elston and Raven 1992:37-39) appear to be represented by the assemblage? What does the assemblage tell us about the lithic terrane in which the site is located (Goodyear 1993); and are the lithic sources used most commonly by site occupants nearby or more distant? What are the sources of obsidian or FGVR? What does this tell us about the lithic terrane?

7. Is there evidence of the use of chert bifaces as cores for the production of expedient tools (Kelly 1988) or for flake blanks used to produce preforms and projectile points?

<u>Data Needs</u>: Questions 4-11 require raw material varieties for which source location can be reasonably determined. Projectile point trajectories and distribution data for complete and broken points and preforms are required. Technological and typological analysis of the assemblage, raw material sourcing, comparison to other assemblages (especially those with temporal control), chronological control of this assemblage, knowledge of lithic terrane, local and regional, are needed.

<u>Data Expectations</u>: It is likely that sources for raw materials can be determined either using either trace element (XRF) or petrographic analysis. Based on the site documentation, obsidian is expected to predominate in the assemblage. Cores, bifaces, preforms, and projectile points recovered from the site may allow questions concerning tool production trajectories to be addressed.

Settlement and Subsistence Patterns

Indirect evidence of subsistence remains may be derived from artifact assemblages. For example, the existence of a fishing industry at Pyramid Lake can be inferred from Tuohy's study of artifacts including sinker stones, a bone fishhook, as well as other tools including projectile points, atlatl weights, milling stones, and basketry fragments (Willig et al.1988:23). Settlement pattern studies in a relatively small project area rely on existing regional data to find answers to questions about the position of the sites within the regional pattern.

Regional archaeological data will be reviewed to provide a basis for inferring resources available to site occupants in the course of a year's foraging. The lithic studies described above and the analysis of any paleoenvironmental and subsistence data recovered from the site will provide the basis for inferring what resources were actually used by site occupants as well as the size and composition of groups that comprised the occupant populations over time.

Based on the discussion above, the following research questions are posed:

<u>Research Questions (Settlement and Subsistence)</u>

8. Was this small rockshelter actually occupied or was it used to store or cache materials?

9. Is there evidence for abandonment of the shelter during the Initial Middle Holocene due to harsh and dry environmental conditions?

10. If suitable depositional contexts are present (i.e. buried features) what types of plant foods were exploited and processed on milling equipment and can these data help determine seasonality of occupation?

11. What faunal resources were targeted in this area and is there evidence of resource depression?

12. If present, did the populations targeted change over time, and is this preserved in the faunal record?

13. Is there evidence for season of use?

Data Needs: The best quality data required to address the questions include season-specific datable tool use-wear studies and examination of a small percentage of tools for residues. Dating of individual features or remains (e.g., hearths; cache pits) is necessary to determine if reoccupation occurred years or decades apart. Drawing site stratigraphic profiles can help identify site structure, discrete activities and possibly gender differentiated uses.

Data Expectations: We expect that at a minimum we will be able to identify the depositional settings, activities represented, and intensity of occupation at the rockshelter based on the stratigraphic profiles.

Chapter 4. Recommended Treatment

Based on eligibility recommendations made by Miller et al. (1996) and determinations by the BLM, site 26PE2786 is considered eligible for listing on the NRHP. The site may be directly impacted by the proposed expansion of the Radio Tower Pit.

Data Recovery Recommendations

The purpose of data recovery is to collect surface and subsurface cultural deposits in order to recover the National Register values from the site, and to address research concerns. Subsurface deposits exceeding 25 cm are expected inside of the shelter. The depth of cultural deposits on the ledge outside of the shelter is unknow but is not expected to exceed 25 cm. A sketch map for the site is presented in Figure 3. Data recovery of site 26PE2786 requires the completion of five tasks:

Task 1: Permit Applications. Upon approval of the Treatment and Data Recovery Plan by BLM, WCRM will apply to the BLM Nevada State Office for an Archaeological Resource Protection Act (ARPA) permit. Once the permit is signed and a schedule for the fieldwork is established, WCRM will apply for a Fieldwork Authorization from the BLM HRFO.

Task 2: Fieldwork: The fieldwork task entails organization of materials, equipment, and personnel; mapping of the site, features, the locations of excavation units, surface collection and mapping of artifacts; and controlled excavation of individual units. Once fieldwork is complete, WCRM will request a Notice-to-Proceed from the BLM.

Task 3: Laboratory: This task includes preparation of samples for outside lab analyses, and analysis of collections, and data interpretation. Analysis will be conducted at WCRM's Reno office and in outside laboratories and will occur over a 2-month period after the issuance of the BLM's Notice to Proceed (NTP).

Task 4: Report Preparation: A draft report will be submitted to the BLM for review within 4 months of completion of the lab work. The complete draft report must be submitted no later than 9 months after fieldwork has ceased. BLM will review and provide comments within 60 days. Upon receipt of the BLM comments, WCRM will address the comments within 10 days and will produce a final report and submit it to the BLM.

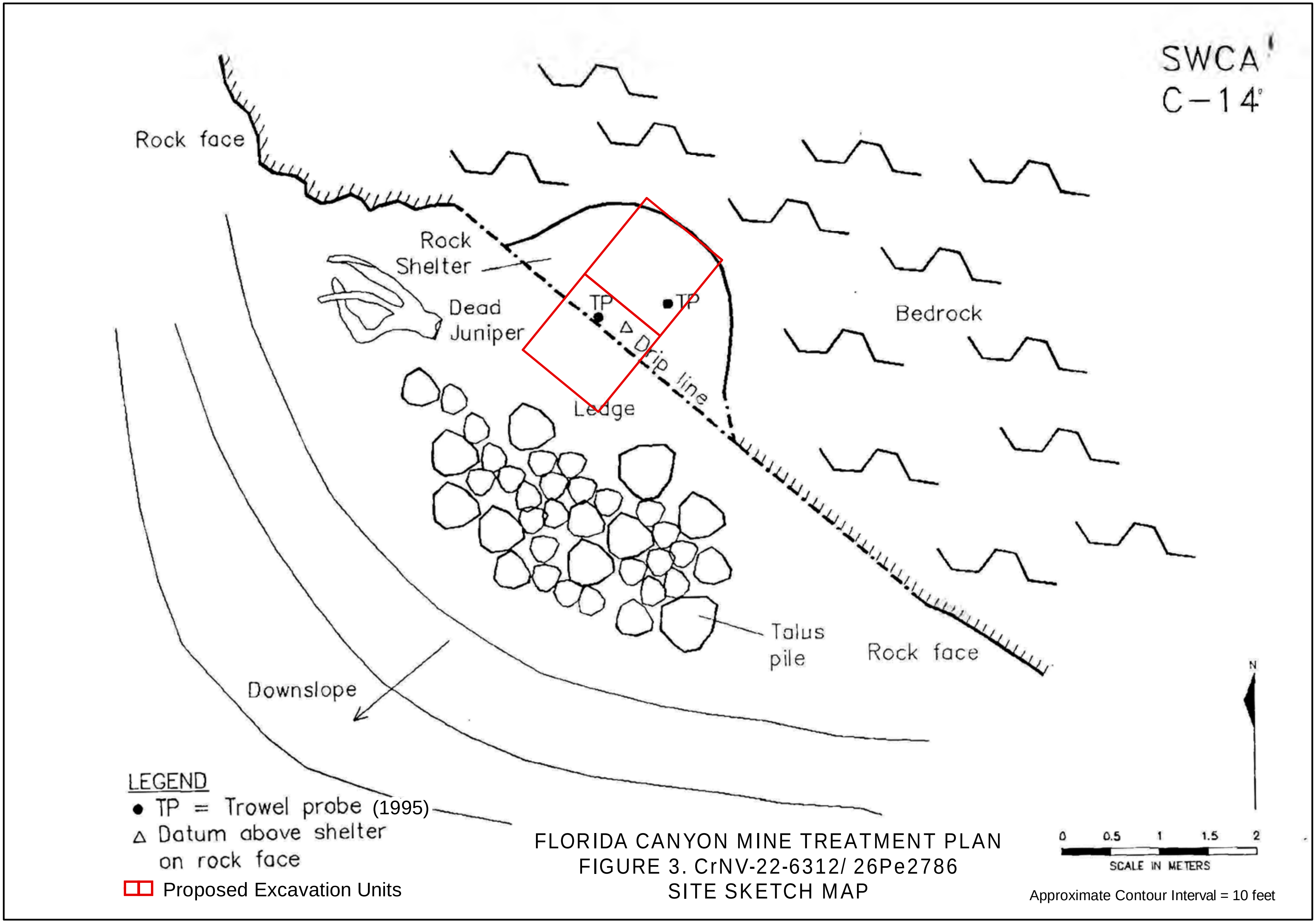
Task 5: Curation: Per the requirements of applicable permits and agreements, all artifacts and residues recovered from public land shall be curated at a federally approved curatorial facility in the State of Nevada. This will be the Nevada State Museum if the collection is accepted.

Proposed Fieldwork

<u>26PE2786</u>

The following fieldwork for the site is proposed:

- Preparation of an updated single IMACS form to be submitted with the final report including information about the site prior to surface collection and excavation, and a narrative about any additional information gathered from the mitigation.
- Mapping of site including site boundaries, features, and the locations of excavation units using a total station or submeter accurate GPS unit;
- All artifacts found on the site surface will be mapped and collected using a total station or GPS unit.
- Setup of two contiguous one-meter square excavation units; one inside the shelter, and one outside of the shelter.



FLORIDA CANYON MINE TREATMENT PLAN
FIGURE 3. CrNV-22-6312/ 26Pe2786
SITE SKETCH MAP

- Excavate the two units in five cm arbitrary levels to a minimum depth of 50 cm or until bedrock is encountered.
- Excavate any features completely, unless they qualify as unexpected discoveries (discussed below).
- If features or significant subsurface deposits are encountered, WCRM will immediately consult with BLM regarding what if any additional work will be required.
- Draw representative profiles of the excavation units.

Schedule

The schedule for fieldwork will be based on the client's needs and approval. Once approved, WCRM recommends the following:

- The permit applications (i.e., ARPA, FAR) will be submitted to the BLM on the day the project is approved by the client.
- Upon receipt of the signed permits, WCRM will prepare an updated IMACS form, map and collect the site and set up and excavate the two units.

It is estimated that the fieldwork will require a crew of two field personnel including the Project Manager and a Crew Member and will be done within a five-day period. Laboratory work will take place within a 2-month period after the issuance of the BLM's NTP, and a draft data recovery report will be submitted to the BLM for review no more than 9 months after the completion of the fieldwork.

Unexpected Discoveries

Although the area outside of site 26PE2786 is largely disturbed, the potential exists for locating unexpected data types during the mitigation of adverse effects within the site boundaries. Unexpected discoveries include human remains, funerary objects, sacred objects, or objects of cultural patrimony.

The Archeological Resource Protection Act (ARPA) codified at 43 CFR 7, as well as the Nevada Revised Statues (NRS) 383.170 provide protection for historic properties, cultural resources, and Native American funerary items and/or physical remains located on federal and private lands.

Any unanticipated discoveries will follow the provisions of the Memorandum of Agreement (MOA).

Curation

Any artifacts, and selected feature fill and other ancillary field samples recovered on public lands along with field notes, and copies of final reports will be curated in accordance with 36 CFR 79 at a federally qualified repository in the State of Nevada. This will be the Nevada State Museum if the collection is accepted. BLM, SHPO, and the standards of the repository will dictate the types and amount of material and records to be curated. In addition, the BLM will receive true copies of all field notes, maps, and records of analyses, photographs, other data and reports upon completion of the project.

Native American Involvement

Consultation for the Treatment Plan will be conducted by the BLM. If human remains are discovered the SHPO will contact the tribes and provide the necessary level of consultation per NRS 383.170.

Chapter 5. Methods

The field and laboratory methods described below focus on all of the research problems discussed previously. The intent of this chapter is to elaborate and explain the various data recovery methods to be employed.

Updating Site Documentation, Mapping and Surface Collection

An IMACS site record was prepared for Site 26PE2786 by SWCA, Inc. in 1995. An updated single IMACS form will be prepared (to be submitted with the final report) including information about the site prior to surface collection and excavation and ultimately including a narrative about any additional information gathered from the mitigation. A sketch map was prepared in 1995 for site 26PE2786, and the site will be remapped. Before the excavation units are laid out, the project team will walk over the site and place pin flags at all artifacts; each will be assigned identifying numbers and their locations will be recorded with a handheld GPS unit.

A primary datum with an arbitrary elevation of 100 m will be established and tied to cadastral survey points in the area if possible. Two one-meter square excavation units will be set up as shown in Figure 3.

After the excavation units are tied into the primary datum, elevations will be taken of all four corners and the center of the excavation unit. Prior to excavation of the units, excavators will be required to map the surface vegetation and note the position of natural or cultural features/materials. The mapping of units will be accomplished using a 1:10 scale.

Topographic and archaeological unit maps (structures and features) will be generated by computer. Detailed maps at a smaller scale will be prepared for any features found on the site.

Collection

All artifacts will be collected from the surface of site 26PE2786. Each artifact will be mapped individually. As mapping is conducted, each tool will be assigned a field specimen (FS) number, which will be noted on a master FS list. Each artifact will be placed in a bag or envelope labeled with the site number, grid location (northing and easting), elevation, FS number, a description of the artifact, the collector's name, and the date.

Subsurface Evaluation

Excavation

The purpose of the subsurface evaluations is to establish the nature and extent of subsurface cultural deposits and identify their potential to address research questions. Two 1x1m excavation units will be excavated in 5 cm intervals. Any features will be excavated in their entirety and may require the expansion of the excavation block.

These excavation units will be excavated to a minimum depth of 50 cm below ground surface or until bedrock is encountered. If additional excavation is needed to examine possible features in the excavation block beyond those specified above, WCRM will contact BLM with justification for expanding the excavation within a block and BLM will evaluate WCRM's recommendation and respond with a decision by email.

The results of excavations will be recorded on standardized excavation record forms, which record horizontal provenience (site, feature, grid location), vertical provenience (level and depth below datum and present ground surface), date excavated, excavators, a detailed map, and lists of field and ancillary specimens collected from each unit. Features will be recorded on separate forms to ensure detailed data concerning feature provenience, morphology, soil matrix, and associated cultural and natural materials are gathered. Profiles will be drawn of all probable features. Site investigations will be further documented with photography. Digital photographs will be taken of the site in general, all features, and various stages of excavations.

During the course of the fieldwork, all collected material will be checked in on a daily basis. Each specimen will be checked against field records.

Specialized Studies

As previously stated, two trowel probes previously excavated at the site yielded only one obsidian flake but indicated the potential for subsurface cultural deposits. Because the surface and subsurface assemblage of the site is limited, the BLM has directed WCRM to forego proposing specific specialized studies until excavation at the site is complete. The following section describes some of the studies that would potentially be utilized pending the results of fieldwork. Table 2 provides a list of potential outside analysts.

Table 2. Potential Outside Analysts

Type of Study	Name of Analyst and/or Company
FGVR sourcing	Maury Morgenstein, Geosciences Management Institute
Obsidian sourcing	Richard Hughes, Geochemical Research Laboratory
Radiocarbon analysis	Beta Analytic
Macrobotanical & starch analysis	David Rhode, Great Basin & Mojave Paleoenvironmental Consulting & Research
Faunal analysis	Shannon Goshen

Paleoenvironment

Trends in past biotic environments may be investigated. Several varieties of data will be collected for environmental reconstruction. Vertical columns of soil samples may be collected from controlled excavation units. The association of each sample with soil strata will be noted. If present, faunal, macrobotanical, and charcoal samples will be collected.

Geochemistry

Studies of FGVR, and obsidian geochemistry may be done in an attempt to determine toolstone sources and artifact provenance. Non-destructive methods such as X-Ray Fluorescence (XRF) and Energy Dispersive XRF (EDXRF) may be employed on temporally diagnostic artifacts Obsidian and FGVR sourcing may be done via XRF and possibly Optical Petrography. If a sufficient sample of obsidian is present, obsidian hydration may be utilized to help develop a relative chronology for the site.

Radiocarbon Dating

Dateable charcoal samples may be sent to Beta Analytic for radiocarbon dating. Faunal remains may also be sent for radiocarbon dating if they are suitable. Faunal remains suitable for analysis must contain sufficient collagen in order to obtain an AMS date. In addition, outer layers of the bone contaminated by humic or fulvic acids visible contaminants such as rootlets must be removed prior to analysis. With proper pre-treatment and the presence of sufficient collagen, bones can yield highly accurate dates which can be critical to determining the absolute chronology of a site especially if charcoal or other organic materials are absent.

Excavation Methods

Excavation with vertical and horizontal control will be done in 1x1m units. Such units may target thermal features such as prehistoric hearths and roasting facilities. It is assumed that in most cases all subsurface features and stratified remains will be completely excavated per standard archaeological procedures. For example, if a feature extends into other units, those units and enough units around it to determine the nature of the activities associated with the feature will be excavated. In the event that the site contains significant subsurface cultural deposits, BLM will be contacted to assess the need for additional excavation.

Individuals will be assigned to dig and to record notes for one-meter squares (grid units) of the excavation grid. The grid unit designation is always the coordinates of the southwest corner, measured from the site datum. The grid unit designation is expressed as meters north or south and east or west from that datum. Excavators, besides noting special characteristics of individual squares, will keep more general notes on the excavations including those on spatial distribution of any finds. Separate excavation record forms, as discussed above, will be used by individual excavators for each level of a one-meter square.

Prior to excavation, individual excavators will begin by recording the surface characteristics of their squares. Whenever possible, the mapping of units will be done at a 1:10 scale. On the surface map the excavator records exact elevations of all four corners. Subsequent maps of lower levels will contain the elevation of the southwest corner for that level.

Excavation begins with careful troweling or shovel scraping to judge the density and nature of cultural material. Excavation levels will be in 5 cm increments. The purpose of using arbitrary levels of 5 cm thickness is to control the vertical provenience of cultural material recovered from the screen and not piece plotted with three dimensional coordinates to the nearest centimeter. However, if natural or cultural strata do appear, these will be used as separate levels of provenience and their top and bottom elevations will be noted. At the same time such strata which are thick enough will be divided at the original, even decimal divisions. Depths of levels will frequently be checked with laser levels and metric stadia rods. Contours of natural and cultural layers are to be recorded on excavation record maps.

Within a given level, artifacts and other cultural remains will be carefully exposed. Furthermore, they should initially be left in situ on vertically sided pedestals so that any potential associations can be revealed. At the end of each level, diagnostic field specimens and ancillary field specimens (non-artifactual cultural materials) are mapped on excavation records and their proveniences recorded. Both line levels and laser levels tied to a unit datum and a metric stadia rod are used for taking the elevations of these specimens. Their X and Y coordinates are recorded to the nearest centimeter using metric tapes extended from the south and west edges of individual meter squares. Strings set between grid pins together with plumb bobs, if necessary, will be used in these cases. As an example, a meter square whose southwest corner has coordinates of 115N/120E contains an artifact lying 25 cm north of the southern edge of the unit and 30 cm east of the western edge, the X-Y coordinates of the artifact would, therefore, be 115.25N/120.30E. Such artifacts with individual proveniences should appear on the map for that level.

Once these provenience data are recorded for the specimens of a given level, the artifacts are ready to be collected. If certain significant or plentiful materials are exposed, however, this collection should be halted until corresponding levels in adjacent squares have also been examined and possible relationships between squares can be noted. The supervisor should be consulted before collection in this case.

It is possible that features may be encountered. Several modifications in recording the provenience of associated artifacts would then be warranted. Those materials collected in a given one-meter square straddling a feature (i.e., a large hearth) must be distinguished as being on the inside or outside of the feature.

Excavations of a given area proceeds with care that vertical walls are maintained with volumetric control. Any roots encountered should be clipped, not pulled. A supervisor will be responsible for seeing that significant features and occupational surfaces are photographed. The supervisor is also responsible for checking excavation forms and sample labels for completeness and accuracy in the field after individual levels of meter units are completed.

Following the completion of excavation, the south and west walls (or if need be, two other contiguous walls) of the excavation units will be lightly troweled from top to bottom in preparation for the drawing of profiles. The supervisor will be responsible for ensuring that these drawings are drafted correctly and that photographs are made.

Collection During Excavation

Field specimens defined as diagnostic artifacts, such as projectile points and formed lithic tools, are to be placed individually in strong paper envelopes or plastic boxes as cases warrant. Non-diagnostic artifacts such as debitage will be bagged together for individual levels in a given square. Fragile and perishable materials will be carefully treated in the field in terms of removal from the ground (especially lifting) packaging and transportation. Consolidation of some items may be required using synthetic materials such as B72. Any consolidation will be performed by the supervisor. All materials identified as perishable and fragile in the field will be photographed and mapped in situ before removal procedures are undertaken.

Collection containers will include small paper coin envelopes, plastic Ziploc® bags, plastic vials, plastic boxes containing foam core dividers, brown paper "lunch sacks," and full-sized grocery bags, depending on the size and condition of the artifact. The containers will be labeled with provenience and other information including: site number, feature number, north and east coordinates of the find (or for glass and metal fragments, coordinates of the one-meter unit's southwestern corner) depth below ground surface using the southwest corner where possible, elevation relative to datum, date, excavator's initials, brief artifactual description, and FS number. Each one-meter square will have its own series of continuous FS numbers beginning with the first level and ending with the completion of the excavation. Again, indelible marking pens will be used.

Ancillary field specimens (AFS) or non-artifactual materials (such as shell, bone, and macrobotanical remains) may require special collection procedures. They will, however, be packaged with labels containing the same information as field specimens. A separate set of continuous numbers beginning with the first level and ending with the completion of excavation is kept for AFS numbers too. Small, unidentifiable bones will be collected together for a given level of an individual square unit being assigned a single AFS number. They are to be packed in cotton and sturdy vials or boxes. Larger identifiable bones, macrobotanical remains, etc. will be provenienced, assigned separate AFS numbers, and protectively packaged as before. All provenienced AFS numbers should appear on the excavation record map for each level.

Radiocarbon dating based on the collection of charcoal and charred materials including seeds is considered extremely important. Samples will be removed with care and hand-picked in the laboratory. Soil samples for macrobotanical purposes will be collected and put in double plastic bags. A minimum of two liters of soil should constitute a sample. Care should be taken so that the sample is not packed tightly. This may crush small specimens in the soil. Soil samples should be extracted in small chunks ca. 2 cm thick so as not to damage small inclusions by trowel scraping. Care is taken with all soil samples so that provenience labels are protected from moisture damage. The best technique is to put labels in separate airtight plastic bags that are then included with the soil bags.

Features

Features, such as hearths, will be cross sectioned and then excavated their entirety in most cases. Munsell soil colors and sediment descriptions will be recorded both within the feature itself and to its immediate exterior. When soil staining would suggest the presence of charred plant remains or other botanical materials, soil samples will be taken; one from the center of the secondary feature and one from each of the four cardinal directions 50 cm away from the secondary feature's edge. Each of these samples should be at least one cup in size. These outside samples establish control for the secondary feature contents and may contain evidence of processing outside of the feature proper.

Laboratory Methods

Prehistoric Artifact Analysis

Laboratory analysis of prehistoric and aboriginal material includes the technological, typological, and functional aspects of these materials. These data lend themselves to addressing questions such as "how were they made?", "what were they (tool type, function) and what do they compare to (cross dating)?", and "what were they used for?" Patterns in artifact manufacture sequences can be used to define technologies, which tend to be conservatively maintained in culturally distinct groups. Typology supports the interpretation of both function and cross dating. Function, determined by morphology and patterns of use wear, allows behavioral interpretation. This data will be combined with the spatial analysis to further assess and interpret the archaeological deposits at the site.

Debitage and tools will be examined to establish whether chipped stone tool manufacturing processes and distribution of chipped stone can be identified through space and time. The technological analysis is based on the concept of manufacturing systems, rather than a particularistic typological approach. In this manner, each piece of tool stone modified by human action is representative of a particular systemic context. If enough representatives of a particular technological system are identified through analysis, it is possible to reconstruct the reduction system.

Technologies, including lithic technologies, are some of the most stable cultural systems. If distinctive lithic technologies are defined as part of this data collection project, it may be possible to identify the presence of individual technologies in a stratified context. Paleoarchaic reduction strategies differ considerably from Clovis (Paleoindian) reduction strategies (Collins 1999; Davis, et al. 2012; Flenniken and Ozbun 1988; Muto 1976). Similarly, various Early and Middle archaic dart points and associated preforms can be distinctive from more Late Archaic small flake based arrow point technology (Stoner 2001; Thomas 1981, 2013; Yohe 1998).

The reconstruction of lithic technological systems is based on attribute analysis. Specific attribute states are diagnostic of specific reduction systems. Measurement of these attributes permits the reconstruction of the reduction technologies. Once these are defined, the spatial relationships of artifacts representing various stages of reduction and various reduction technologies can be analyzed in order to begin to understand the patterns of human behavior as they occurred on the site in question.

Analysis is based upon the following defined criteria. A diagnostic tool refers to a tool that is a member of a particular tool type. A tool type is a group of tools that are more similar to each other on the basis of shared attributes than they are to another group which comprise a separate tool type. The types are defined based on sets of shared attributes (e.g., stemmed, indented base projectile points as opposed to straight base, corner-notched projectile points). An attribute is a recognizable characteristic that is usually morphological in nature, such as blade form or base shape. Wherever possible, the analyses will employ metric data to quantify the magnitude of variation of an attribute, rather than simply using qualitative categories to define variation within an attribute.

Diachronic changes to lithic assemblages and production technologies are evidenced by changes in form, function, and spatial distributions. The form and function of all tools will be investigated, as will those of a sample of the debitage. The manner in which lithic assemblages change through time will be documented.

Detailed laboratory analysis of material recovered from the site will focus around inventorying and encoding attributes of the assemblage. Artifacts will be grouped into six main categories and analyzed accordingly: lot debitage (debitage collected by "lot" for each level of each unit); analyzed flakes (flakes sampled from the lot debitage that are analyzed in much greater detail); flaked lithic tools, projectile points, ground stone, and, finally, tools exhibiting use wear. For more details regarding the attributes to be analyzed for each of the six artifact categories, the reader is referred to the laboratory manuals in Appendix C. Artifacts that do not fit the six categories listed above would be sent to local or regional experts. For example, samples of fire-altered-rock (FAR) might be sent to an outside expert to recover starch and/or phytolith residues. All data for analyzed artifacts (or artifact lots, in the case of lot debitage) will be entered into a Microsoft (MS) Access database. Each of the six main artifact categories will be given a corresponding database table.

Photography

Investigations and artifacts will be documented with photography and use of a flatbed scanner. Digital photographs will be taken of the site in general, all features, and the various phases of excavations. Images of artifacts will be produced using a Nikon D-3100 camera.

Chapter 6. Project Personnel and Schedule

The project will follow required personnel qualifications from the BLM Manual 8143 for principal investigator, crew members, and specialists. The supervisory team proposed to conduct the data recovery in the Florida Canyon Mine Radio Tower Pit Expansion project has extensive collective experience in prehistoric and historic archaeology and the conduct of large multidisciplinary data recovery projects. The team includes:

Thomas J. Lennon, PhD., RPA - Principal Investigator
Edward J. Stoner, M.A., RPA – Project Director

Complete resumes for Lennon and Stoner are found in Appendix B.

Thomas J. Lennon

Dr. Thomas J. Lennon has been involved in cultural resources management since 1974. He holds Ph.D. (Anthropology), M.A. (Anthropology) and B.A. (History) degrees, and over 37 years' experience in cultural resources making him uniquely qualified as a principal investigator and project manager. Dr. Lennon worked on hundreds of professional projects from the Pacific Coast to the Great Plains. During this time Dr. Lennon has brought together the study team proposed for this project and as a result WCRM has become recognized as the leader in archaeology consulting Dr. Lennon has the experience and vision needed to successfully manage the work proposed for the Florida Canyon Mine Radio Tower Pit Expansion project.

Edward J. Stoner, Jr.

Mr. Edward J. Stoner, Jr. has been involved in cultural resources management since 1984. He holds a B.A. degree in Anthropology, with a minor in Geology, an M.A. in Anthropology, and is a Registered Professional Archaeologist (RPA). Mr. Stoner has worked in ever increasingly responsible roles on over two hundred professional projects from Oregon and California east to the Rocky Mountains and Great Plains. He has worked with WCRM as Project Manager and/or Laboratory Director on projects involving historic and prehistoric sites since 1988. Among the major projects similar to the one proposed here that Mr. Stoner has helped direct are: excavation of nine rockshelter sites at the Lake Range Quarries National Register District, extensive excavations of prehistoric camp sites in the Robinson Mining District near Ely and Fire Creek near Crescent Valley, Nevada, prehistoric village sites in Reno and Carson City, Nevada and recent large-scale data recovery projects in Black Rock Desert and in Goshute Valley. These projects have given Mr. Stoner extensive experience in project management and understanding of Great Basin prehistory, lithic technology, and lithic procurement invaluable to the work proposed for the Florida Canyon Mine Radio Tower Pit Expansion project.

Proposed Project Schedule

The proposed schedule for fieldwork will be based on the client's needs and approval. Once approved, WCRM recommends the following schedule:

Table 3. Proposed Project Schedule

Task	Duration	Estimated Start Date	Estimated Completion Date
BLM/SHPO Approval of the HPTP	TBD	TBD	TBD
BLM Execution of a Project MOA	TBD	TBD	TBD
Task 1: ARPA Permit and Project Authorization The permit applications (i.e., ARPA, FAR) will be submitted to the BLM on the day the project is approved by the client.	1 day	Upon approval of HPTP and Execution of a Project MOA	TBD
Approval of ARPA and FWA	TBD	TBD	TBD
Task 2: Fieldwork Prepare an updated IMACS form, mapping and collect the site and set up and excavate the two units.	5 days	TBD	TBD
BLM issuance of the NTP	TBD	After completion and approval of fieldwork.	TBD
Task 3: Laboratory Analysis	2 months	After the BLM issues an NTP following completion and approval of fieldwork.	TBD
Task 4: Report Preparation A draft data recovery report will be submitted to the BLM for review no more than nine months after the completion of the fieldwork.	9 months	Start task upon completion of fieldwork	TBD
Task 5: Curation	TBD	TBD	TBD

Chapter 7. References Cited

Adams, Kenneth D., Ted Goebel, Kelly Graf, Geoffrey M. Smith, Anna J. Camp, Richard W. Briggs and David Rhode

2008 Late Pleistocene and Early Holocene Lake-Level Fluctuations in the Lahontan Basin, Nevada: Implications for the Distribution of Archaeological Sites. *Geoarchaeology* 23(5):608-643.

Adovasio, James M

1974 Prehistoric North American Basketry. In *Nevada State Museum Anthropological Papers 16,* edited by D. R. Tuohy and D. L. Rendall, pp. 98-148. Nevada State Museum, Carson City.

Aikens, C. Melvin

1970 *Hogup Cave. University of Utah Anthropological Papers 93*. University of Utah Press, Salt Lake City.

1994 Adaptive Strategies and Environmental Change in the Great Basin and its Peripheries as Determinants in the Migrations of Numic-speaking Peoples. In *Across the West: Human Population Movement and the Expansion of the Numa*, edited by D. B. Madsen and D. Rhode, pp. 35-43. University of Utah Press, Salt Lake City.

Alley, Richard B.

2000 Ice-core Evidence of Abrupt Climate Changes. *Proceedings of the National Academy of Sciences* 97(4):1331-1334.

Andrefsky, W., Jr.

1994 Raw-Material Availability and the Organization of Technology. *American Antiquity* 51(1):38-50.

1998 *Lithics: Macroscopic Approaches to Analysis*. Cambridge University Press, New York, NY.

Ataman, K., and W. W. Bloomer

1992 Opalite Reduction Trajectories. In *Archaeological Investigations at Tosawihi, A Great Basin Quarry,* edited by R. G. Ralston and C. Raven, pp. 637-654. Intermountain Research, P. O. Drawer a, Silver City, NV 89428.

Ataman, K., W.W. Bloomer, C.L. Furnis, C. Hodges, R. McQueen, J. Northrup, E. Obermayer, M. Rucks and C. Zeier

2001 *Summer in the Sierras: 6,000 Years of Occupation in Bagley Valley*. Prepared by Summit Envirosolutions. Prepared for the Humboldt-Toiyabe National Forest, Contract # TY-53-9360-0-01.

Bacon, Steven N, Raymond M Burke, Silvio K Pezzopane and Angela S Jayko

2006 Last glacial maximum and Holocene lake levels of Owens Lake, eastern California, USA. *Quaternary Science Reviews* 25(11):1264-1282.

Bamforth, Douglas B.

2002 Evidence and Metaphor in Evolutionary Archaeology. *American Antiquity* 67:435-452.

Beck, Charlotte and George T. Jones

1997 The Terminal Pleistocene/Early Holocene Archaeology of the Great Basin. *Journal of World Prehistory* 11(2):161-236.

Bedwell, Stephen F

1970 Prehistory and Environment of the Pluvial Fort Rock Lake Area of South Central Oregon, Anthropology, University of Oregon, Eugene.

Bengston, Ginny

2003 *Northern Paiute and Western Shoshone Land Use in Northern Nevada: A Class I Ethnographic/Ethnohistoric Overview. Cultural Resource Series No. 12*. Bureau of Land Management, Reno.

Benson, Larry V.

1978 Fluctuation in the level of pluvial Lake Lahontan during the last 40,000 years. *Quaternary Research* 9(3):300-318.

Benson, Larry V., Donald Currey, Yong Lao and Steve Hostetler
1992 Lake-size variations in the Lahontan and Bonneville basins between 13,000 and 9000 14C yr BP. *Palaeogeography, Palaeoclimatology, Palaeoecology* 95(1-2):19-32.
Benson, Larry V., Michael S. Berry, Edward A. Jolie, Jerry D. Spangler, David W. Stahle and Eugene M. Hattori
2007 Possible Impacts of Early 11th, middle 12th, and late 13th Century Droughts on Western Native Americans and the Mississippian Cahokians. *Quaternary Science Reviews* 26(3-4):336-350.
Benson, Larry V., Michaele Kashgarian, Robert Rye, Steve Lund and Steve Paillet
2002 Holocene Multidecadal and Multicentennial Droughts Affecting Northern California and Nevada. *Quaternary Science Reviews* 21:659-682.
Benson, Larry V., SP Lund, JP Smoot, DE Rhode, RJ Spencer, KL Verosub, LA Louderback, CA Johnson, RO Rye and RM Negrini
2011 The rise and fall of Lake Bonneville between 45 and 10.5 ka. *Quaternary International* 235(1):57-69.
Bettinger, Robert L.
1994 How, When, and Why Numic Spread. In *Across the West: Human Population Movement and Expansion of the Numa*, edited by D. B. Madsen and D. Rhode, pp. 44-55. University of Utah Press, Salt Lake City.
1999a From traveler to processor: regional trajectories of hunter-gatherer sedentism in the Inyo-Mono region, California. In *Settlement Pattern Studies in the Americas: Fifty Years Since Viru*, edited by B. R. Billman and G. Feinman, pp. 39-55. Smithsonian Institution Press, Washington, DC.
1999b What Happened in the Medithermal? In *Models for the Millenium: Great Basin Anthropology Today*, edited by C. Beck, pp. 62-74. University of Utah Press, Salt Lake City.
Bettinger, Robert L. and Martin A. Baumhoff
1982 The Numic Spread: Great Basin Cultures in Competition. *American Antiquity* 47(3):485-503.
Bloomer, W. W., K. Ataman, and E. E. Ingbar
1992 Bifaces. In *Archaeological Investigations at Tosawihi, A Great Basin Quarry,* pp. 81-132, R. G. Elston and C. Raven, editors. Intermountain Research, P. O. Box Drawer A, Silver City, NV 89428.
Bodily, Mark L.
2009 Residential Mobility of Paleoarchaic and Early Archaic Occupants at North Creek Shelter (42GA5863): An Analysis of Chipped Stone Artifacts, Unpublished Master Thesis Anthropology, Brigham Young University.
Bower, Alfred W. and C.N. Savage
1962 Primitive Man on Browns Bench. His Environment and His Record. *Idaho Bureau of Mines and Geology, Information Circular No. 14*:1-22.
Bravo, Leonore M.
1991 *Rabbit Skin Blanket*. Braun-Brumfield Inc., USA.
Bryan, Alan L.
1979 Smith Creek Cave. In *The Archaeology of Smith Creek Canyon, Eastern Nevada*, edited by D. R. Tuohy and D. L. Rendall, pp. 162-253. Nevada State Museum, Carson City.
Clewlow, C. William Jr.
1968 *Surface Archaeology of the Black Rock Desert, Nevada*. University of California Archaeological Survey Reports 73. University of California, Berkeley.
Collins, Michael B.
1999 *Clovis Blade Technology*. University of Texas Press, Austin.
Cresswell, R.
1983 Transferts de techniques et chaînes opératoires. *Techniques et Culture* 2:145-164.
Cunnar, Geoffrey E. and Edward J. Stoner
2016 Processing, Power, Teaching and Identity, The Utilitarian and Ritual Use of Artifacts from a Middle Archaic Shaman's House in the Great Basin. Paper presented at the Society for American Archaeology 81st Annual Meeting, Orlando.

Cunnar, Geoffrey E., Edward J. Stoner and Charles W. Wheeler
2015 *The Archaeology of the Fire Creek National Register Archaeological District, Lander County, Nevada: Data Recovery at Loci AR, S, V, Y, AJ, AG, and AC.* Prepared for Klondex Mines by Western Cultural Resource Management. Bureau of Land Management. Report No. N-49643 on file at Battle Mountain BLM Office, Nevada.
Cunnar, Geoffrey E., Edward J. Stoner and Thomas F. Bullard
2016 Reconstructing a Paleoarchaic Afternoon 12,000 years ago, at Fire Creek, Nevada. Paper presented at the 35th Great Basin Anthropological Conference, Reno, Nevada.
Cunnar, Geoffrey E., Edward Stoner, Charles Wheeler and Rocky Brockway
2017 *Treatment and Data Recovery of 151 sites at the Long Canyon Mine, Elko County, Nevada.* Report prepared for Newmont Mining Corporation, Long Canyon Mine. Western Cultural Resource Management Inc., Sparks, Nevada.
Cunnar, Geoffrey E., William Schindler, Edward J. Stoner, Charles Wheeler, Mark Estes and Tom Lennon
2011 Replication of a Paleoarchaic, Levallois-like Reduction Technique in the Great Basin: Trying to Understand one of America's Earliest Reduction Strategies. Poster presented at the 76th Annual Meeting of the Society for American Archaeology, Sacramento, Sacramento, California.
d'Azevedo, Warren
1986 Washoe. In *Great Basin*, edited by W. L. d'Azevedo, pp. 466-498. Handbook of North American Indians. vol. Vol. 11., W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
Dansie, Amy J. and W.J. Jerrems
2005 More bits and pieces: A new look at Lahontan chronology and human occupation. In *Paleoamerican Origins: Beyond Clovis*, edited by R. Bonnichsen, B. T. Lepper, D. Stanford and M. R. Waters, pp. 51-79. Center for the Study of First Americans, Texas A&M University, College Station.
Davis, Loren G. and Samuel C. Willis
2012 Early Lithic Technology at the Cooper's Ferry Site, Idaho. *Proceedings of the 77th Annual Meeting of the Society for American Archaeology*. Memphis.
Davis, Loren G., Samuel C. Willis and Shane J. Macfarlan
2012 Lithic Technology, Cultural Transmission, and the Nature of the Far Western Paleoarchaic/Paleoindian Co-Tradition. In *Meetings at the Margins: Prehistoric Cultural Interactions in the Intermountain West*, edited by D. Rhode, pp. 47-64. The University of Utah Press, Salt Lake City.
Delage, Christophe
2017 Once upon a time… the (hi) story of the concept of the chaîne opératoire in French prehistory. *World Archaeology*:1-16.
Dobres, Marci-Anne
2000 *Technology and Social Agency*. Blackwell, Oxford.
Elston, Robert G.
1986 Prehistory of the Western Area. In *Great Basin, Handbook of North American Indians Volume 11*, edited by W. L. d'Azevedo, pp. 135-148. vol. 11, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
1988 Flaked Stone Tools. In *Preliminary Investigations in Stillwater Marsh: Human Prehistory and Geoarchaeology*, edited by C. Raven and R. G. Elston, pp. 155-183. US Fish and Wildlife Service Cultural Resource Series 1, Portland.
Elston, R. G., and C. Raven, editors
1992 *Archaeological Investigations at Tosawihi, A Great Basin Quarry*. Intermountain Research, P.O. Box Drawer A, Silver City, NV. 89428.
Elston, R. G., and E. E. Budy
1990 The Archaeology of James Creek Shelter. *University of Utah Anthropological Papers*. University of Utah Press, Salt Lake City.

Elston, Robert G. and Jonathan O. Davis
1972 An Investigation of the Steamboat Hot Springs Locality, Washoe County, Nevada. *Nevada Archaeological Survey Reporter* 6(1):9-14.
Elston, Robert G. and David W. Zeanah
2002 Thinking Outside The Box: A New Perspective on Diet Breadth and Sexual Division of Labor in the Prearchaic Great Basin. *World Archaeology* 34(1):103-130.
Estes, Mark B.
2009 *Paleoindian Occupations in the Great Basin: A Comparative Study of Lithic Technological Organization, Mobility, and Landscape Use from Jakes Valley, Nevada*. Unpublished Masters Thesis, The University of Nevada, Reno.
Fagan, J. L.
1988 Clovis and Western Pluvial Lakes Tradition Lithic Technologies at the Dietz Site in South-Central Oregon. In *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface*, edited by J. A. Willig, C. M. Aikens and J. L. Fagan, pp. 389-416. Nevada State Museum Anthropological Papers No. 21. Carson City.
Flenniken, J. Jeffrey
1985 Stone Tool Reduction Techniques as Cultural Markers. In *Stone Tool Analysis Essays in Honor of Don E. Crabtree*, Mark G. Plew, James C. Woods, and Max G. Pavecic, editors, pp. 265-276. University of New Mexico Press, Albuquerque.
Flenniken, J. Jeffrey and Terry L. Ozbun
1988 Archaeological Investigations in Newberry Crater, Deschutes National Forest, Central Oregon. Report prepared for the Deschutes National Forest, Contract No. 53-04GG-7-03430, Bend, Oregon. Lithic Analysts Research Report No. 4, Pullman, Washington.
Fowler, Catherine S. and Sven Liljeblad
1986 Northern Paiute. In *Handbook of North American Indians, Vol. 11, Great Basin*, edited by W. d'Azevedo, pp. 435-465. vol. 11. Smithsonian Institution, Washington, DC.
Fowler, Don D. , David B. Madsen and Eugene M. Hattori
1973 *Prehistory of Southeastern Nevada*. Desert Research Institute Publications in the Social Sciences 6. Desert Research Institute, Reno.
Goebel, Ted
2007 Pre-Archaic and Early Archaic Technological Activities at Bonneville Estates Rockshelter: A First Look at the Lithic Artifact Record. In *Paleoindian or Paleoarchaic? Great Basin Human Ecology at the Pleistocene-Holocene Transition*, edited by K. Graf and D. N. Schmitt, pp. 156-186. University of Utah Press, Salt Lake City.
Goodyear, Albert C.
1974 The Brand Site: A Techno-Functional Study of a Dalton Site in Northeast Arkansas. Arkansas *Archeological Survey, Research Series* 7. Fayetteville.
1979 A Hypothesis for the Use of Cryptocrystalline Raw Materials Among Paleo-Indian Groups of North America. *Research Manuscript Series* 156. University of South Carolina, Institute of Archeology and Anthropology, Columbia.
1993 Tool Kit Entropy and Bipolar Reduction: A Study of Interassemblage Lithic Variability Among Paleo-Indian Sites in the Northeastern Unites States. *North American Archaeologist* 14(1:1-23).
Gould, Richard A.
1980 *Living Archaeology*. Cambridge University Press.
Graf, Kelly
2001 *Paleoindian Technological Provisioning in the Western Great Basin*. Master's thesis, Department of Anthropology, University of Nevada, Las Vegas.
2007 Stratigraphy and Chronology of the Pleistocene to Holocene Transition at Bonneville Estates Rockshelter, Eastern Great Basin. In *Paleoindian or Paleoarchaic? Great Basin Human Ecology at the Pleistocene-Holocene Transition*, edited by K. Graf and D. N. Schmitt, pp. 82-104. University of Utah Press, Salt Lake City.

Grayson, Donald K. (editor)
1994 *Chronology, Glottochronology, and Numic Expansion*. University of Utah Press, Salt Lake City.
Grosscup, Gordon L.
1960 *The Culture History of Lovelock Cave, Nevada*. University of California.
Hall, E. Raymond
1995 *Mammals of Nevada*. University of Nevada Press, Reno.
Halford, F. Kirk
2008 *The Coleville and Bodie Hills MNRCS Soil Inventory, Walker and Bridgeport, California: A Reevaluation of the Bodie Hills Obsidian Source (CA-MNO-4527) and its Spatial and Chronological Use*. Report on file at the BLM, Bishop Field Office, California.
Hamilton, Tara A.
2012 A Case for Paleoindian Use of Pinto Projectile Points in the Great Basin: Morphological Analysis from the Old River Bed, Utah. Masters Thesis. Masters, Anthropology, University of Nevada, Reno.
Hattori, Eugene M.
1982 *The Archaeology of Falcon Hill, Winnemucca Lake, Washoe County, Nevada*. Nevada State Museum Anthropological Papers No. 18, Carson City.
Hattori, Eugene M., Phillip H. Shelley and Donald R. Tuohy
1990 Preliminary Report on Technofunctional Examination of Flaked Stone Artifacts. Paper presented at the 22nd Great Basin Anthropological Conference, Las Vegas.
Hattori, Eugene M. and RT King
1985 *A Select Historical and Archaeological Survey of Carson Valley*. Desert Research Institute, University of Nevada System, Social Sciences Center, Reno
Haynes, Gary
2007 Paleoindian or Paleoarchaic? In *Paleoindian or Paleoarchaic*, edited by K. E. Graff and D. N. Schmitt, pp. 251-258. University of Utah Press, Salt Lake City.
Heizer, Robert F.
1951 Preliminary Report on the Leonard Rockshelter Site Pershing County, Nevada. *American Antiquity* 17(2):89-98.
1956 Recent Cave Exploration in the Lower Humboldt Valley, Nevada. *Reports of the University of California Archaeological Survey No. 33*:50-57.
Heizer, Robert F. and Alex D. Krieger
1956 *The Archaeology of Humboldt Cave, Churchill County, Nevada* 47. Kraus Reprint Co.
Heizer, Robert F. and Thomas R. Hester (editors)
1972 *Notes on Northern Paiute Ethnography: Kroeber and Marsden Records*. Archaeological Research Facility, Department of Anthropology, Berkeley.
1978 *Great Basin Projectile Points: Forms and Chronology*. Ballena Press, Socorro.
Hockett, Bryan S.
1995 Chronology of Elko Series and Split Stemmed Points from Northeastern Nevada. *Journal of California and Great Basin Anthropology* 17(1):41-53.
2007 Nutritional ecology of late Pleistocene to middle Holocene subsistence in the Great Basin: zooarchaeological evidence from Bonneville Estates Rockshelter. In Paleoindian or Paleoarchaic, edited by K. E. Graf and D. N. Schmitt, pp. 204-230. University of Utah Press, Salt Lake City.
2015 The Zooarchaeology of Bonneville Estates Rockshelter: 13,000 years of Great Basin Hunting Strategies. *Journal and Archaeological Science: Reports* 2:291-301.
2017 Personal Communication.
Hockett, Bryan S., Cliff Creger, Beth Smith, Craig Young, James Carter, Eric Dillingham, Rachel Crews and Evan Pellegrini
2013 Large-Scale Trapping Features from the Great Basin, USA: The Significance of Leadership and Communal Gatherings in Ancient Foraging Societies. *Quaternary International* 297:64-78.

Hodder, Ian
2000 Agency and Individuals in Long-Term Processes. In *Agency in Archaeology*, edited by M.-A. Dobres and J. E. Robb, pp. 21-33. Routledge, London.
Holmer, Richard N.
1986 Projectile points of the Intermountain Region. In *Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings*, edited by C. J. Condie and D. D. Fowler, pp. 89-115. University of Utah Press, Salt Lake City.
Jenkins, Dennis L., Loren G. Davis, Thomas W. Jr. Stafford, Linda Scott Cummings, Chad Yost, Thomas J. Connolly, Robert M. II Yohe, Summer C. Gibbons, Maanasa Raghavan, Morten Rasmussen, Johanna L.A. Paijmans, Michael Hofreiter, Brian M. Kemp, Jodi Lynn Barta, Cara Monroe, M. Thomas P. Gilbert and Eske Willerslev
2012 Clovis Age Western Stemmed Projectile and Human Coprolites at the Paisley Caves. *Science* 337:223-228.
Johnson, Maureen G.
1977 *Geology and Mineral Deposits of Pershing County, Nevada*. Nevada Bureau of Mines and Geology, Bulletin 89. Mackay School of Mines, University of Nevada, Reno.
Keefe, Timothy M., Bruce M. Kahl and Suzanne T. Montague
1999 *The Ackerson Post-Fire Archaeological Project, Yosemite National Park, California (Volume I). Yosemite Research Center Technical Report No. 5.*
Kelly, Isabel T.
1939 *Southern Paiute Shamanism* Anthropological Records 2(4). University of California Press, Berkeley.
Kelly, Robert L.
1988 The Three Sides of a Biface. American Antiquity 53(4):717-734.
2001 *Prehistory of the Carson Desert and Stillwater Mountains: Environment, Mobility, and Subsistence in a Great Basin Wetland*. University of Utah Press Anthropological Records Number 123, Salt Lake City.
Kimball, Monique (compiler)
2011 Guide to Historic Artifacts. Unpublished manuscript on file at WCRM, Sparks, Nevada.
Lamb, Sydney M
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.
Larsen, Clark Spencer, Robert L Kelly, Robert L Bettinger, Dale L Hutchinson, Frederika A Kaestle, Joanna E Lambert, Becky K Rolfs, Christopher Ruff, Katherine F Russell and Margaret J Schoeninger
1995 *Bioarchaeology of the Stillwater Marsh: prehistoric human adaptation in the western Great Basin. Anthropological papers of the AMNH; no. 77*. American Museum of Natural History, New York.
Layton, Thomas N. and David H Thomas
1979 *The Archaeology of Silent Snake Spring, Humboldt County, Nevada. Volume 55: Part 3* Anthropological Papers of the Museum of Natural History, New York.
Lenzi, Michael R
2015 An Experimental Program to Evaluate Proposed Functions of Crescents from the Western United States. Masters Thesis, University of Nevada, Reno.
Leroi-Gourhan, André
1964 *Le Geste et la parole. I : technique et langage*. Albin Michel, Paris.
Livingston, Stephanie D.
1986 Archaeology of the Humboldt lakebed site. *Journal of California and Great Basin Anthropology* 8(1):99-115.
Lloyd, Andrea H. and Lisa J. Graumlich
1997 Holocene dynamics of treeline forests in the Sierra Nevada. *Ecology* 78(4):1199-1210.

Loud, Llewellyn Lemont and Mark Raymond Harrington
1929 *Lovelock Cave*. The University of California Publications in American Archaeology and Ethnography, Berkeley.
McGuckian, Margaret Ann
1996 Management Uses of Contemporary Ethnography and the Lovelock Paiute. Masters Thesis, Anthropology, University of Nevada, Reno.
Madsen, David B.
1999 Environmental Change during the Pleistocene-Holocene Transition and Its Possible Impact on Human Populations. In *Models for the Millennium*, edited by C. Beck, pp. 75-83. The University of Utah Press, Salt Lake City.
Madsen, David B. and David Rhode (editors)
1994 *Across the West: human population movement and the expansion of the Numa*. University of Utah Press, Salt Lake City.
Madsen, David B., Dave N Schmitt and David Page
2015 *The Paleoarchaic Occupation of the Old River Bed Delta*. The University of Utah Press, Salt Lake City.
Mead, Jim I., and Christopher J. Bell
1994 Late Pleistocene and Holocene Herpetofaunas of the Great Basin and Colorado Plateau. In Natural History of the Colorado Plateau and Great Basin, edited by Kimball Harper, Larry St. Clair, Kaye Thorne, and Wilford Hess, pp. 255-276. University Press of Colorado.
Mehringer, Peter .J. Jr and Peter E. Wigand
1990 Comparison of late Holocene Environments from Woodrat Middens and Pollen. In *Packrat Middens: The Last 40,000 Years of Biotic Change*, edited by J. L. Betancourt, T. R. VanDevender and P. S. Martin, pp. 294-325. The University of Arizona Press, Tucson.
Mensing, Scott A., Larry V. Benson, Michaele Kashgarian and Steve Lund
2004 A Holocene pollen record of persistent droughts from Pyramid Lake, Nevada, USA. *Quaternary Research* 62:29-38.
Miller, F., B. Clark, C. Wenker, M. Turek, J. Hirschi, S. Uram, and J. Caouette
1996 *A Class III Cultural Resource Inventory of the Florida Canyon Mine Study Area, Pershing County, Nevada*. Bureau of Land Management Report Number CR2-2689. Prepared by SWCA, INC., Salt Lake City, Utah.
Miller, J.D., D Germanoski, K. Waltman, R. Tausch and J. Chambers
2001 Influence of late Holocene hillslope processes and landforms on modern channel dynamics in upland watersheds of central Nevada. *Geomorphology* 38(373-391).
Moore, Mark W.
1992 Data Recovery Plan for the Mahoney Canyon Quarry Complex, White Pine County, Nevada. Ms. on file, BLM, Ely District Office.
Moore, Mark W., and Bertrand T. Young
1992 *Evaluation of Archaeological Site 26Wp1682 (BLM #046-2733) White Pine County, Nevada*. Report on file, Bureau of Land Management, Ely District Office.
Muto, Guy R.
1976 The Cascade Technique: An Examination of A Levallois-Like Reduction System in Early Snake River Prehistory. Ph.D., Anthropology, Washington State University, Pullman.
O'Connell, James F.
1971 The Archeology and Cultural Ecology of Surprise Valley, Northeast California, Anthropology, University of California, Berkeley.
1975 *The Prehistory of Surprise Valley*. Anthropological Papers, No. 4. Balena Press, Ramona.
O'Connell, James F. and Cari M. Inoway
1994 Surprise Valley Projectile Points and Their Chronological Implications. *Journal of California and Great Basin Anthropology* 16(2):162-198.

Orr, Phil C.
1956 *Pleistocene Man in Fishbone Cave Pershing County Nevada*. The Nevada State Museum Department of Archaeology Bulletin No. 2. Nevada State Museum, Carson City.
Oviatt, Charles G., David B. Madsen and Dave N. Schmitt
2003 Late Pleistocene and early Holocene rivers and wetlands in the Bonneville basin of western North America. *Quaternary Research* 60(2):200-210.
Pinson, Ariane O.
2007 Artiodactly Use and Adaptive Discontinuity Across the Paleoarchaic/Archaic Transition in the Northern Great Basin. In *Paleoindian or Paleoarchaic, Great Basin Human Ecology at the Pleistocene/Holocene Transition*, edited by K. Graf and D. N. Schmitt, pp. 187-203. The University of Utah Press, Salt Lake City.
Preucel, Robert W. and Stephen A. Mrozowski (editors)
2010 *Contemporary Archaeology in Theory, The New Pragmatism* 2nd edition ed. West Sussex. Wiley-Blackwell.
Ross-Hauer, JoEllen
2008 A Class III Cultural Resources Inventory of 1980 Acres for the Ann Mason Project, Lyon County, Nevada. BLM Report No. CR3-2441 (P), Carson City, Nevada. Prepared by Chambers Group, Inc. for Enviroscientists Inc.
Rozaire, C.E.
1974 Analysis of Woven Materials from Seven Caves in the Lake Winnemucca Area, Pershing County, Nevada. In *Collected Papers on Aboriginal Basketry*, edited by D. R. Tuohy, pp. 59-97. Nevada State Museum Anthropological Papers No. 16, Carson City.
Rusco, Mary K., and Jonathan O. Davis
1987 The Old Humboldt Site – 26PE670. In Studies in Archaeology, Geology and Paleontology at Rye Patch Reservoir, Pershing Count, Nevada, edited by Mary K. Rusco and Jonathan O. Davis, pp 41-73. *Nevada State Museum Anthropological Papers* 20, Carson City.
Sassaman, Kenneth E.
1992 Lithic Technology and the Hunter-Gatherer Sexual Division of Labor. *North American Archaeologist* 13(3:249-262).
Schiffer, Michael B.
1975 Behavioral Chain Analysis: Activities, Organization, and the Use of Space. *Fieldiana* 65:103-174.
2000 Social Theory in Archaeology. In Social Theory in Archaeology, edited by M. B. Schiffer, pp. 1-13. The University of Utah Press, Salt Lake City.
Schmitt, Dave N and David B. Madsen
2005 *Camels Back Cave. Anthropological Papers 125.* University of Utah Press, Salt Lake City.
Sellet, Frederic
1993 Chaîne opératoire: The Concept and Its Applications. *Lithic Technology* 18:106-112.
Shott, Michael J.
2003 Chaîne Opératoire and Reduction Sequence. *Lithic Technology* 28:95-105.
Smith, Geoffrey
2006 Pre-Archaic Technological Organization, Mobility, and Settlement Systems: A View from the Parman Localities, Humboldt County, Nevada. M.A. thesis, Anthropology Department, University of Nevada, Reno.
2007 Pre-archaic mobility and technological activities at the Parman localities, Humboldt County, Nevada. In *Paleoindian or Paleoarchaic*, edited by K. E. Graff and D. N. Schmitt, pp. 139-155. The University of Utah Press, Salt Lake City.
Smith, Geoffrey M., Pat Barker, Eugene M. Hattori, Anan W. Raymond and Ted Goebel
2013 Points in Time: Direct Radiocarbon Dates on Great Basin Projectile Points. *American Antiquity* 78(3):580-594.

Stearns, S. and T. Hal Turner
1985 *Archaeological Investigations of 26DO326 in Carson Valley, Nevada*. Manuscript on file at the State of Nevada Department of Transportation Cultural Resources Section, Carson City, Nevada.
Steward, Julian H.
1936 *Myths of the Owens Valley Paiute*. University of California Press, Berkeley.
1941 *Cultural element distributions: XIII, Nevada Shoshone*. Anthropological Records, vol. 4, No.2. University of California Press, Berkeley.
Stewart, Omer C.
1939 *The Northern Paiute Bands*. University of California Press.
1941 *Culture Element Distributions: XIV, Northern Paiute*. University of California Anthropological Records 4(3), Berkeley.
Stoner, Edward J.
2001 Quarriers, Arrow Makers, and Hunters of the Egan Range: A Case for Integrated Toolstone Procurement, Stone Tool Production, and Subsistence. Unpublished Master's Thesis, University of Nevada, Reno.
Stoner, Edward J., Mary K. Rusco and Leif J. Christian
2001 *Apáwadetdé' yi' Village: The Archaeology of the Sunridge Site (26Do439), Douglas County, Nevada*, Prepared for the Environmental Protection Agency and Las Vegas Paving Corporation. Manuscript on file Western Cultural Resource Management, Inc., Nevada.
Stoner, Edward J., Mary C. Ringhoff, Robert R. Peterson and Jennifer Sigler
2006 *The Archaeology of "The Biggest Little City in the World." The ReTRAC Project, Reno, Washoe County, Nevada: Prehistoric Resources*. Prepared for the City of Reno, Nevada. Manuscript on file Western Cultural Resource Management, Inc.
Tausch, Robin J., Cheryl L. Nowak and Scott Mensing
2004 Climate Change and Associated Vegetation Dynamics during the Holocene: The Paleoecological Record. In *Great Basin Riparian Ecosystems: Ecology, Management and Restoration*, edited by J. C. Chambers and J. R. Miller, pp. 24-48. London, Island Press.
Thomas, David H.
1981 How to Classify the Projectile Points from Monitor Valley, Nevada. *Journal of California and Great Basin Anthropology* 3(1):7-43.
1983 *The Archaeology of Monitor Valley 2. Gatecliff Shelter*. Anthropological Papers of the American Museum of Natural History 59. American Museum of Natural History, New York.
1985 *The Archaeology of Hidden Cave*. Anthropological Papers of the American Museum of Natural History 61. American Museum of Natural History, New York.
1994 Chronology and the Numic Expansion. In *Across the West: Human Population Movement and the Expansion of the Numa. University of Utah Press, Salt Lake City*, edited by D. B. Madsen and D. Rhode, pp. 56-61. University of Utah Press, Salt Lake City.
2013 Great Basin Projectile Point Typology: Still Relevant? *Journal of California and Great Basin Anthropology* 33(1):133-152.
2014 Alta Toquima: Why Did Foraging Familes Spend Summers at 11,000 feet? In *Archaeology in the Great Basin and Southwest Papers in Honor of Don D. Fowler*, edited by N. J. Parezo and J. C. Janetski, pp. 130-148. The University of Utah Press, Salt Lake City.
2016 Revisiting Numic Ethnogenesis. Paper presented at the 35 Great Basin Anthropological Conference, Reno, Nevada.
Torrence, Robin
1986 Production and Exchange of Stone Tools. *New Studies in Archaeology.* Cambridge University Press.

Tuohy, Donald R.
1970 The Coleman Locality: A Basalt Quarry and Workshop near Falcon Hill Nevada. *Nevada State Museum Anthropological Paper* 15(4):143-205.
1974 A Cache of Fine Coiled, Feathered and Decorated Baskets from Western Nevada. *Nevada State Museum Anthropological Papers No. 16*:28-46.

Tuohy, Donald R. and L. Kyle Napton
1986 Duck Decoys from Lovelock Cave, Nevada, Dated by 14C Accelerator Mass Spectrometry. *American Antiquity* 51(4):813-816.

Vaughn, Patrick
1985 *Use-Wear Analysis of Flaked Stone Tools*. University of Arizona Press, Tucson.

Waters, Michael R.
1992 *Principles of Geoarchaeology: A North American Perspective*. The University of Arizona Press, Tucson.

Wenker, C.
1995 Original IMACS form for Site 26PE2786. On file with Winnemucca District Bureau of Land Management.

Western Regional Climate Center
2018 Climate Summary for Lovelock, Nevada. Electronic resource, https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?nv4698, accessed April 20, 2018.

Wheat, Margaret M
1967 *Survival arts of the primitive Paiutes*. University of Nevada Press, Reno.

Wheeler, Charles W., Edward J. Stoner and Robert R Peterson
1992 *Data Recovery at the Lake Range Quarry*. Prepared for AMAX Wind Mountain Mining, Inc. Document on file Bureau of Land Managment, Winnemucca, Nevada. Western Cultural Resource Management Inc., Sparks, Nevada.

Wigand, Peter E.
2010 The Environmental Context for Human Occupation in the Central Great Basin. In *The Sierra Pacific Falcon Project: Archaeological Excavations in Central and Eastern Nevada*, edited by K. Ataman and A. Quinlan, pp. 85-114. Summit Environ-solutions, Inc. BLM Report No. BLM 1-229g, Reno.

Wigand, Peter E. and David Rhode
2002 Great Basin vegetation history and aquatic systems. The last 150,000 years. In *Great Basin Aquatic Systems History. Smithsonian Contributions to Earth Sciences, vol. 33*, edited by R. Hershler, D. B. Madsen and D. R. Currey, pp. 309-367. Smithsonian Institution Press, Washington D.C.

Wigand, Peter E., M.L. Hemphill, S. Sharpe and S. Patra
1995 Great Basin semi-arid woodland dynamics during the late Quaternary. In *Proceedings: Climate change in the four corners and adjacent regions: Implications for environmental restoration and land-use planning*, edited by W. J. Waugh, pp. 51-70. U.S. Department of Energy, Mesa State College, Grand Junction, Colorado.

Willig, Judith A.
1989 Paleo-Archaic Broad Spectrum Adaptations at the Pleistocene-Holocene Boundary in Far Western North America, Ph.D. Department of Anthropology, University of Oregon, Eugene.

Willig, Judith A. and Melvin C. Aikens
1988 The Clovis-Archaic Interface in Far Western North America. In *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface*, edited by J. A. Willig, M. C. Aikens and J. L. Fagan, pp. 1-40. Nevada State Museum Anthropological Papers Number 21, Carson City.

Willig, J. A., C. M. Aikens, and J. L. Fagan, editors
1988 *Early Human Occupation in Far Western North America: The Clovis-Archaic Interface*. Nevada State Museum Anthropological Papers 21. Carson City.

Yohe, Robert M

1998 The introduction of the bow and arrow and Lithic resource use at Rose Spring (CA-INY-372). *Journal of California and Great Basin Anthropology*:26-52.

Young, D. Craig and Allen McCabe

2005 *Fletcher Junction Exploration Project: Cultural Resources Inventory of 20 Drill Hole Locations and Access Routes.* . Prepared for Pediment Gold LLC, Reno, Manuscript on file at Far Western Anthropological Research Group, Davis, California. USFS Report No. R2005041701605

Young, Craig D., William R. Hildebrandt, Steven D. Neidig and Sharon A. Waechter

2009 *From Fish Springs to Dry Valley: Archaeological Investigations on the Vidler Water Project Corridor, Washoe County, Nevada.* BLM Report No. CR3-2237-8. Manuscript on file Bureau of Land Management, Reno.

APPENDIX A
SITE DOCUMENTATION

IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by:
BLM - Utah, Idaho, Wyoming, Nevada
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

*1. State No. Pe2786
*2. Agency No. CrNV-22-6312
3. Temp. No. SWCA C14
County: Pershing

4. State: Nevada
5. Project: Pegasus Archaeological Survey
*6. Report No.: CR2-2689(P)
7. Site Name / Property Name: n/a
8. Class: [x] Prehistoric [ ] Historic [ ] Paleontologic [ ] Ethnographic
9. Site Type: Rockshelter habitation
*10. Elevation 6260 ft.
*11. UTM Grid: Zone |1|1| |3|9|7|1|0|0| m E |4|4|9|1|5|4|0| m N
*12. SW of NW of NE of Sec. 13, T. 31 N, R. 033 E
*13. Meridian: Mt. Diablo
*14. Map Reference: Star Peak
15. Aerial Photo: n/a
16. Location and Access: From the Humboldt exit on I-80, follow the eastern frontage road north to Humboldt Canyon Road. Follow this dirt road east, past the ruins of Humboldt City to the head of the canyon. Proceed along the road for 0.9 mile as it climbs the ridges to the south. At the crest of a high ridge, leave the dirt road and follow the ridge to the west for 0.3 mile. Proceed south along the eastern side of a large bedrock outcrop for 200 m to the site.

*17. Land Owner: BLM
*18. Federal Administrative Units: Nevada BLM, Winnemucca District
*19. Location of Curated Materials: n/a
20. Site Description: A small east facing rockshelter, situated high above Florida Canyon, containing three obsidian flakes at the modern surface and an obsidian flake at a depth of 10 cm below the modern surface which was located in a trowel test probe. The site is very small, but probably contains intact buried deposits.

*21. Site Condition: [ ] Excellent (A) [x] Good (B) [ ] Fair (C) [ ] Poor(D)
*22. Impact Agent(s): erosion

*23. National Register Status: [x] Significant [ ] Not Significant [ ] Unevaluated
Justify: This site appears to contain intact buried deposits that may yield data pertinent to the comprehension of prehistoric lifeways, an issue identified in the research design for this survey (BLM Report #CR2-2689 (P)). This site is considered NRHP eligible.

24. Photos: Roll Pegasus I, Roll 3; Pegasus II, Roll 3 ; Frames 11; 24
25. Recorded by: C. Wenker
*26. Survey Organization: SWCA, Inc. Environmental Consultants
*28. Survey Date: 9-18-95
27. Assisting Crew Members: H. West

Attachments: [x] Part B [x] Topo Map [x] Photos [ ] Continuation Sheets
[ ] Part C [x] Site Sketch [ ] Artifact/ Feature Sketch [ ] Other
[ ] Part E

* Encoded Data Items

Part A - Environmental Data

Site No. SWCA C14

*29. Slope: 35 (Degrees) 150 Aspect (Degrees)

*30. Distance to Permanent Water: 6 x 100meters

*Type of Water Source: [ ] Spring/Seep (A) [x] Stream/River (B) [ ] Lake(C) [ ] Other (D)

Name of Water Source: Florida Canyon

*31. Geographic Unit: Grass Valley

*32. Topographic Location: - See Guide for additional information

Primary Landform:
[ ] Mountain Spine (A)
[ ] Hill (B)
[ ] Tableland/Mesa(C)
[x] Ridge (D)
[ ] Valley (E)
[ ] Plain (F)
[ ] Canyon (G)
[ ] Island (H)

Secondary Landform:
[ ] Alluvial Fan (A)
[x] Alcove/Rock Shelter (B)
[ ] Arroyo (C)
[ ] Basin (D)
[ ] Cave (E)
[ ] Cliff (F)
[ ] Delta (G)
[ ] Detached Monolith (H)
[ ] Dune (I)
[ ] Floodplain (J)
[ ] Ledge (K)
[ ] Mesa/Butte (L)
[ ] Playa (M)
[ ] Port Geo Feature(N)
[ ] Plain (O)
[ ] Ridge/Knoll (P)
[ ] Slope (Q)
[ ] Terrace/Bench (R)
[ ] Talus Slope (S)
[ ] Island (T)
[ ] Outcrop (U)
[ ] Spring Mound/Bog (V)
[ ] Valley (W)
[ ] Cutbank (X)
[ ] Riser (Y)
[ ] Multiple S. Landforms (1)
[ ] Bar (2)
[ ] Lagoon (3)
[ ] Ephemeral Wash (4)
[ ] Kipuka (5)
[ ] Saddle/Pass (6)
[ ] Graben (7)

Describe: This site is on a high southeast facing ridge slope on the north side of Florida Canyon. The shelter is a small alcove at the base of a jagged outcrop of limestone crossing the east side of the ridge. The alcove is fronted by a stable talus pile that retains a small ledge in front of the shelter. The ledge has accumulated soils.

*33. On Site Depositional Context

[ ] Fan (A)
[ ] Talus (B)
[ ] Dune (C)
[ ] Stream Terrace (D)
[ ] Playa (E)
[ ] Outcrop (Q)
[ ] Extinct Lake (F)
[ ] Extant Lake (G)
[ ] Alluvial Plain (H)
[x] Colluvium (I)
[ ] Moraine (J)
[ ] Flood Plain (K)
[ ] Marsh (L)
[ ] Landslide/Slump (M)
[ ] Delta (N)
[ ] Desert Pavement (P)
[ ] Stream Bed (R)
[ ] Aeolian (S)
[ ] None (T)
[ ] Residual (U)

Description of Soil: Very light gray silt containing common gravels and cobbles of bedrock fragments. No stratigraphy was noted in test probes.

34. Vegetation:

*a. Life Zone

[ ] Arctic-alpine (A) [ ] Hudsonian (B) [ ] Canadian (C) [ ] Transitional (D) [X] Upper Sonoran (E) [ ] Lower Sonoran (F)

*b. Community: Primary On Site O Secondary On Site R Surrounding Site 2

Aspen (A)
Spruce-Fir(B)
Douglas Fir (C)
Alpine Tundra (D)
Ponderosa Pine (E)
Lodgepole Pine (F)
Other/Mixed Conifer (G)
Pinyon-Juniper Woodland (H)
Wet Meadow (I)
Dry Meadow (J)
Oak-Maple Shrub (K)
Riparian (L)
Grassland/Steppe (M)
Desert Lake Shore (N)
Shadscale Community (O)
Tall Sagebrush (P)
Low Sagebrush (Q)
Barren (R)
Marsh/Swamp (S)
Lake/Reservoir (T)
Agricultural (U)
Blackbrush (V)
Creosote Bush (Y)

Describe: Rabbitbrush is common, with various bunch grasses. Low sagebrush and rare junipers.

*35. Miscellaneous Text

36. Comments/Continuations: The shelter itself is very small, only approximately 1.25 m high at the front, 3.20 m wide and 1.12 m deep, with a narrow ledge in front of it, approximately 4 m long x 1 m wide.

* Encoded Data Items

Part B - Prehistoric Sites

Site No.(s) SWCA C14

1. Site Type Rockshelter habitation

	Cultural Affiliation	Dating Method	Cultural Affiliation	Dating Method
2. Culture:	Unknown	none		

Describe:

3. Site Dimensions: 3 m x 4 m *Area 12 sq m

4. Surface Collection/Method: [x] None(A) [ ] Designed Sample (C) [ ] Grab Sample(B) [ ] Complete Collection (D)
   Sampling Method:

5. Estimated Depth of Fill: [ ] Surface (A) [ ] 20 - 100cm (C) [x] Fill noted but unknown (E) [ ] 0 - 20cm (B) [ ] 100cm + (D) [ ] Depth suspected but not tested (F)
   How Estimated: Two trowel probes
   (If tested, show location on site map)

6. Excavation Status: [ ] Excavated (A) [x] Tested (B) [ ] Unexcavated (C)
   Testing Method Two subjectively placed trowel probes were excavated, no screening.

7. Summary of Artifacts and Debris: *(Refer to guide for additional categories)*
   [x] Lithic Scatter (LS) [ ] Isolated Artifact (IA) [ ] Burned Stone (BS) [ ] Bone Scatter (WB)
   [ ] Ceramic Scatter (CS) [ ] Organic Remains (VR) [ ] Ground Stone (GS) [ ] Charcoal Scatter (CA)
   [ ] Basketry/Textiles (BT) [ ] Shell (SL) [ ] Lithic Source(s):
   Describe: Four obsidian flakes comprise the artifacts at the site. Three were on the modern surface, and the fourth came from the probe outside the shelter on the ledge. The obsidian is probably from the Majuba source.

*8. Lithic Tools: Quantity Type Quantity Type

Describe:

*9. Lithic Debitage - Estimated Quantity:
   [ ] None (A) [ ] 10 - 25 (C) [ ] 100 - 500 (E)
   [x] 1 - 9 (B) [ ] 25 - 100 (D) [ ] 500 + (F)
   Material Type obsidian
   Flaking Stages: (0) Not Present (1) Rare (2) Common (3) Dominant
   Decortication 0 Secondary 2 Tertiary 2 Shatter 0 Core 0

10. Maximum Density - #/sq m (all lithics): 3/sq m

* Encoded Data Items

Part B - Prehistoric Sites

Site No.(s) SWCA C14

*11. Ceramic Artifacts: Quantity Type Quantity Type

Describe:

12. Maximum Density - #/sq m (ceramics):

*13. Non-architectural Features (locate on site map): *(See guide for additional categories)*

[ ] Hearth/Firepit (HE) [ ] Rubble Mound (RM) [ ] Earthen Mound (EM) [ ] Water Control (WC)
[ ] Midden (MD) [ ] Stone Circle (SC) [ ] Burial (BU) [ ] Petroglyph (PE)
[ ] Depression (DE) [ ] Rock Alignment (RA) [ ] Talus Pit (TP) [ ] Pictograph (PI)

Describe:

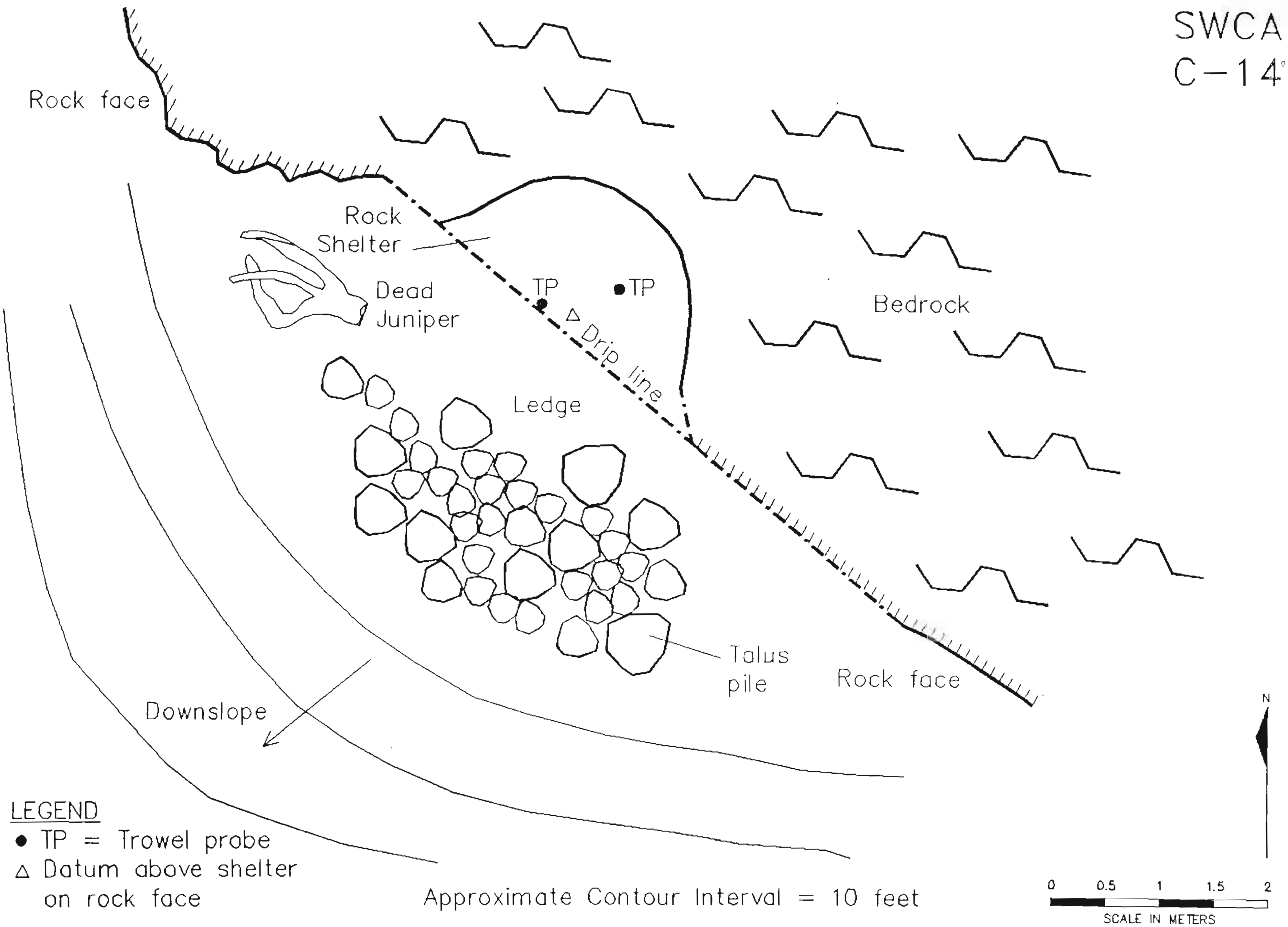
*14. Architectural Features (locate on site map):

Quantity Material Type Quantity Material Type

Describe:

15. Comments/Continuations: One probe at the dripline of the shelter went down 10 cm and a secondary obsidian flake was located. One probe inside the shelter went down 25 cm. Fill kept going but no cultural materials were located. The potential for intact deposits appears good, since no disturbances were evident.

* Encoded Data Items



Site CrNV-22-6312. Sketch map.

Site CrNV-22-6312. View of shelter, facing west.

1990

IMACS ENCODING FORM

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

Encoder's Name C. Wenker

A

1 26-PE- (27860) State Site Number | 2 22-Ø6312 Agency Site Number | 6 CR22689P Agency Report Number | 10 Ø626Ø Elevation | 11 Zone 11, Easting 3971ØØ, Northing 449154Ø

12 1/4 SW; 1/4 NW; 1/4 NE; Sec. 13; T. 31 N; R. Ø33 E

13 Merid. 7

14 USGS Map STAR PEAK

17 Owner LM

18 Forest ___ Dist./Park BE

19 Loc. Curated Materials ___

21 Cond. B

22 Impacts EK

23 N.R. C

26 Organ. ST

28 Survey Date Ø9-18-95

29 Slope 35 Aspect 15Ø

30 Water: distance/type ØØ6 B

31 Geog. Unit BJG

32 Topographic Location 1st D 2nd B

33 Dep. I

34 Vegetation 1 E 2 QR 3 2

35 Misc. Text, Site Name ___

B

2 Culture/Dating Method ZZA

3 Area ØØØ12

4 Collect A

5 Depth E

6 Excav. Status B

7 Prehistoric Artifacts LS

8 Lithic Tools: # / type Ø

9 # B Flaking Stages ØZ2ØØ

11 Ceramics: # / type A

13 Features: # / type

14 Architecture: # / material / type

C

2 Historic Themes

3 Cultures / Dating Method

4 Dates

5 Area

6 Collect.

7 Depth

8 Excav. Status

9 Artifacts

14 Features: # / type

15 Architecture: # / material / type

APPENDIX B
RESUMES FOR KEY PROJECT PERSONNEL

Thomas Joseph Lennon, Ph.D., RPA

President

Personal Information:

WCRM address:	P.O. Box 2326, Boulder, Colorado 80306
WCRM phone:	303-449-1151
WCRM Email:	tom.lennon@wcrminc.com

Academic Background/Education:

University of Colorado, Boulder, **Ph.D. in Anthropology**; Emphasis: Archaeology; Ph.D. Dissertation Title: *Raised Fields of the Lake Titicaca Region of Peru: A Pre-Hispanic Water Management System* Ph.D. Research funded by National Science Foundation, Fulbright Commission, and University of Colorado, Department of Anthropology, 1982
University of Colorado, Boulder, **M.A. in Anthropology**; Emphasis: Archaeology, 1975
Fairfield University, Fairfield, Connecticut, **M.A. in Human Communication, Corporate and Political**; 1973
Montana State University, Bozeman, Peace Corps instruction, 1968
International Rice Institute, Kauai, Hawaii, Peace Corps instruction, 1968
Ithaca College, **B.A. in History**, minor in Literature, 1968

<u>University Teaching Experience</u>:
Instructor, Spring Semester, Division of Continuing Education, University of Colorado, 1983
Instructor, Fall Semester, Division of Continuing Education, University of Colorado, 1982
Teaching assistant, Fall Semester, Department of Anthropology, University of Colorado, 1978
Teaching assistant, Spring Semester, Department of Anthropology, University of Colorado, 1977

<u>Continuing Education</u>:

October 2013	<u>Mediation Process Training</u>. Presented by Jonathan Bartsch, Ryan Golten, and Angela Jo Woolcott of Collaborative Decision Resources (CDR) Associates, Boulder, Colorado.
Earned 2013	<u>Udall Certificate in Environmental Collaboration</u>. Awarded for completion of the Environmental Conflict Resolution Program through the Udall Foundation, Tucson, Arizona.
May 2013	<u>Facilitation and Mediation of Public and Environmental Conflicts</u>. Presented by Jonathan Bartsch of Collaborative Decision Resources (CDR) Associates, Boulder, Colorado.
January 2013	<u>Effective Tribal Consultation</u>. Presented by Milton Bluehouse of the U.S. Institute for Environmental Conflict Resolution, Udall Foundation, Phoenix, Arizona.
May 2012	<u>Collaboration in NEPA</u>. Presented by Mike Eng of the U.S. Institute for Environmental Conflict Resolution, Udall Foundation, Denver, Colorado.
December 2010	<u>Introduction to Managing Environmental Conflict</u>. Presented by Joan Calcagno of the U. S. Institute for Environmental Conflict Resolution, Udall Foundation, Reno, Nevada.
September 2010	<u>Multi-Party Negotiation of Environmental Disputes</u>. Presented by Cherie Shanteau-Wheeler of the U. S. Institute for Environmental Conflict Resolution, Udall Foundation, Denver, Colorado.
April 2010	<u>Interest-Based Negotiation of Environmental Issues</u>. Presented by Jeffrey Silvyn of the U. S. Institute for Environmental Conflict Resolution, Udall Foundation, Denver, Colorado.
Winter 2010	<u>Archaeological Law Enforcement</u>. Presented by Archaeological Resource Investigations, Inc. at the Southern Ute Tribal Offices. Martin McAllister and Chuck Wheeler, Instructors, Ignacio, Colorado.
April 2007	<u>NEPA for Cultural Resource Managers</u>. Dr. Thomas King, Instructor. Farmington, New Mexico.
April 2006	<u>The Cultural Side of NEPA</u>. Dr. Thomas King, Instructor. Las Vegas, Nevada.
March 2005	<u>Issues in Section 106: An Advanced Seminar</u>. Dr. Thomas King, Instructor. Phoenix, Arizona.

Areas of Interest:

Cultural Resource Management
Archaeology of the Western United States
South American Prehistory and Ethnography

Membership in Professional Organizations:

American Cultural Resource Association, Board of Directors (1996-1999; 2001-2002)
Register of Professional Archaeologists
Society of Professional Archaeologists
Society for American Archaeology
Society of Historic Archaeology
Institute of Andean Studies

Employment:

Present:
Western Cultural Resource Management, Inc., **President**, 1983 – Present

Previous:
Western Cultural Resource Management, Inc., **Vice-President**, 1978 – 1982
University of Colorad0-Boulder, Department of Anthropology, **Research Associate**, 1982 – 1988
U. S. Geological Survey, Paleontology and Stratigraphy Division, **Laboratory Technician**, 1977 – 1978
U. S. National Park Service, Denver, **Archaeologist**, 1975

Grants/Awards:

New York State Regents Scholarship, 1964-1968
New York State Scholarship Incentive Award, 1964-1968
Fulbright-Hays Fellowship (Peru), 1976-1977
National Science Foundation/Dissertation Improvement Grant (BNS 76-19861), 1976-1979
Earl Morris Award for Academic Excellence and Research in Archaeology, University of Colorado, 1977

Special Awards:

Project: Southern Delivery System
Award: Reclamation Certificate of Appreciation
Date: May 20, 2009
Awarded: To Tom Lennon "In acknowledgement of your contribution in preparation of the Environmental Impact Statement for the Southern Delivery System."

Project: AT&T Nexgen/Core
Award: 32nd Annual New Mexico Heritage Preservation Award
Date: May 14, 2004
Awarded: To WCRM (Josh Jones, Tom Lennon, Tim Kearns, and Chuck Wheeler) and AT&T (Peggy Womack) "for excellence in Southwestern archaeology."

Panel Chair:

American Exploration and Mining Association's Technical Session, December 7, 2016, 2 – 5:30PM
Title: Planning for a Seat at the Cultural Resource Table: Understanding Process, Anticipating Issues for Mining Projects

Chaired by:	Tom Lennon, Western Cultural Resource Management and Connie Rogers, Davis Graham & Stubbs LLP
Subject:	This technical session addressed the latest trends in National Historic Preservation Act Section 106 compliance and mitigation for cultural resource concerns. It specifically addressed how to plan early for a seat at the table with state and federal agencies and other stakeholders. There was also a discussion of evolving survey requirements, the definition of "significance" under the NHPA, mitigation alternatives and recent approaches to Memoranda of Agreement, Programmatic Agreements and Historic Properties Treatment Plans. Further, there was discussion regarding coordination of NHPA compliance with reviews under the National Historic Preservation Act. Lastly, the latest issues in enforcement and permitting under the Archaeological Resources Protection Act, how to handle confidential information, and cultural resources monitoring were reviewed and presented by the panel with discussion from the audience.

Papers Given:

1994	Historic Mining Landscapes in the Western United States, with Dr. Don Hardesty and Dr. Steve Mehls, World Archaeology Conference, New Delhi India.
1988	Sites, Soils, and Paleoenvironment in the Upper Colorado River Valley. Presented at the 46th Annual Plains Conference, Wichita with William Killiam and Charles W. Wheeler.
1988	Archaeological Investigations in Rio Abiseo National Park, Department of San Martin, Peru. Institute of Andean Studies Annual Meeting, Berkeley, California.
1985	The Remote Sensing Applications in the Rio Abiseo National Park, Peru. With Jane Wheeler and Tom Sever. American Anthropology Association Meetings, Washington, D.C.
1983	The Crisis in Cultural Resource Studies. Paper presented at Symposium on the Crisis in Cultural Resource Management, Society for Applied Anthropology, High Plains Region Section, Denver.
1982	Cultural Resource Study Approaches for the 1980s Paper presented at the American Mining Congress, Denver.
1982	Pattern Analysis of Pre-Hispanic Raised Fields of Lake Titicaca, Peru. Paper prepared for the XLIV International Congress of Americanists, Manchester.
1979	An Archaeological Investigation of Raised Field Patterns, Lake Titicaca, Peru. Paper presented at the XLIII International Congress of Americanists, Vancouver.

International Foreign Experience:

Projects:

1996	Cerro Don Mario Precious Metals Project, Bolivia. For Orvana Resources Corporation. Review of cultural resource requirements and planning assistance for proposed gold mine project.
1994-1995	Quebrada Honda Project, Peru. For Woodward Clyde Associates, Inc. Quality control review of fieldwork and reports for WWC, Inc.
1994	Cambior Metals Project, Northwestern Mexico. Principal Investigator for field study and report preparation for proposed mine exploration project; Dr. Mike Foster served as WCRM Project Manager.
1985-1989	Rio Abiseo National Park, Peru. Natural and cultural resource inventory of 1600 square kilometer national park in northeastern Peru; development of resource management and conservation plan. From January to September 1985, served as co-director with Jane Wheeler. From September 1985-1988, served as Director of the Rio Abiseo National Park Research Project.
1984	Rio Abiseo National Park, Peru. Field reconnaissance to assess feasibility of research project; supported by University of Colorado, Department of Anthropology.
1976 - 1982	Lake Titicaca Peru, Raised Field Research Project Dissertation research; 14 months of fieldwork with a crew of eight. Survey and test excavations of sites in the Titicaca Basin with a Peruvian counterpart. While in Peru, I was a Field Investigator for the Museo Nacional de Antropologia y Arqueologia under Dr. Luis Lumbreras, Museum Director. Research was funded by the National

	Science Foundation, Fulbright Commission and the University of Colorado, Department of Anthropology. Dr. Payson Sheets, Dissertation Advisor, University of Colorado.
1975	Field Reconnaissance of Habitation Areas, Copan, Honduras. Crew leader. Field reconnaissance and ground truthing of aerial photography for prehistoric sites surrounding the Maya site of Copan, Honduras. Dr. James Hester, Principal Investigator, University of Colorado.
1968 - 1969	Peace Corps Volunteer, Guayas River Basin, Ecuador. Agricultural extension liaison between local rice cooperatives and U.S.-A.I.D. supported development projects in tropical lowlands of southern Ecuador.

Reports and Publications:

1994	*Letter Report; Results of Field Study for Cambior Metals Project, Northwestern Mexico*; Principal Investigator; Dr. Mike Foster served as WCRM Project Manager.
1989	*Informe Final 1989: Recursos Culturales, Proyecto de Investigacion Parque Nacional Rio Abiseo. With Segundo Vasquez and Warren Church*; report presented to the Instituto Nacional de Cultura, Lima.
1989	*Archaeological Investigations in Rio Abiseo National Park, Department of San Martin, Peru*. With Warren B. Church and Miguel Cornejo. For submittal to Boletin de Lima.
1988	*Informe Preliminar: Recursos Culturales 1988, Proyecto de Investigacion Parque Nacional Rio Abiseo*. With Segundo Vasquez; report presented to the Instituto Nacional de Cultura, Lima.
1987	*Informe Final: Recursos Culturales 1986, Proyecto de Investigacion Parque Nacional Rio Abise*o. With Warren Church and Miguel Cornejo; report presented to the Instituto Nacional de Cultura, Lima.
1986	*Informe Preliminar de Los Trabajos Realizados por el Proyecto de Investigacion en el Parque Nacional de Rio Abiseo: Recursos Culturales 1986*. With Miguel Cornejo; report presented to the Instituto Nacional de Cultura, Lima.
1986	*Informe Final de Los Trabajos Realizados Por el Proyecto de Investigacion En El Parque Nacional Rio Abiseo*. With Miguel Cornejo; report presented to the Instituto Nacional de Cultural, Lima.
1985	*Informe Preliminar de Los Trabajos Realizados por el Proyecto de Investigacion en el Parque Nacional de Rio Abiseo with Miguel Cornejo*; report presented to the Instituto Nacional de Cultura, Lima.
1983	Pattern Analysis of Pre-Hispanic Raised Fields of Lake Titicaca, Peru. *In Drained Fields: History and Potential*, J.P. Darch and R.T. Smith, eds. British Archaeological Reports, Oxford. Pages 183-200.
1982	*Raised Field of Lake Titicaca, Peru: A Pre-Hispanic Water Management System*. University Microfilms, Ann Arbor, Michigan. 344 pages.
1977	*Informe Preliminar Sobre La Investigation de los Camellones de la Cuenca de Lago Titicaca*. Preliminary field report prepared for the Museo Nacional de Antropologia y Arqueologia, Lima.

United States Experience:

Since 1974, I have been involved in cultural resource management studies in the Western United States. Much of my experience has come as an archaeological consultant to federal, state, and industrial clients through Western Cultural Resource Management, Inc. (WCRM), a Boulder based corporation. Since 1978, WCRM has grown to become a highly recognized cultural resource consulting firm in the western United States. Studies have been conducted in Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Wyoming. I have managed numerous kinds of cultural resource projects including Environmental Assessments, Environmental Impact Statements, background and literature reviews, technical analyses of mine plans, sample surveys, intensive inventories, test excavations, mitigation data recovery plan development and mitigation projects. My professional staff size has ranged from 15-150 people, depending on the size and number of projects. In the past seven years, I have successfully managed annual budgets ranging from $5,000 to millions of dollars.

A brief summary of projects and reports follows. All cultural resource studies produced by Western Cultural Resource Management, Inc., have been completed under Federal Professional Services Antiquities Permits, issued to WCRM with Thomas J. Lennon as Principal Investigator.

Native American Consultation/Issues (Selected):

2016-Present I-80/I-580/US 395 System to System Interchange Reconstruction (Reno Spaghetti Bowl), Nevada. Conducted for FHWA NDOT through CH2MHill. The tribes involved include: Reno-Sparks Indian Colony, Pyramid Lake Paiute, Washoe of California and Nevada.

2016-Present Florence Copper, Inc. In-Situ Copper Recovery Project Production Test Facility, Pinal County, Arizona. Conducted for the EPA and Florence Cooper, Inc. The Gila River Community is involved.

2015-Present Long Canyon Project, Nevada. Conducted for the BLM through Newmont Mining Corporation. The tribes involved include: Wells Band of the Te-Moak Tribe of Western Shoshone and Confederated Tribes of the Goshute Reservation.

2015-Present Pyramid Highway/Sun Valley/US 395 Connector Project, Nevada. Conducted for the BLM and NDOT through Jacobs Engineering. The tribes involved include: Reno-Sparks Indian Colony, Pyramid Lake Paiute, Washoe of California and Nevada.

2003-Present Southern Delivery System Reservoir Project, Colorado Springs-Pueblo, Colorado. Conducted for the Bureau of Reclamation through MWH Americas, Inc. The tribes involved include: Apache Tribe of Oklahoma, Cheyenne and Arapaho Tribes of Oklahoma, Comanche Nation of Oklahoma, Fort Sill Apache, Jicarilla Apache, Kiowa Tribe of Oklahoma, Mescalero Apache, Northern Arapaho, Northern Cheyenne, Northern Ute, Pawnee Nation of Oklahoma, Shoshone (Eastern Band), Shoshone-Bannock, Southern Ute, Uintah and Ouray, and Ute Mountain Ute.

2012-2015 Bear Lodge Project, Wyoming. Conducted for Rare Elements Resources and USFS Black Hills National Forest. Tribes included Northern Cheyenne, Northern Arapaho, Standing Rock Sioux, Oglala Sioux, Rosebud Sioux, Mandan, Hidatsa and Arikara Nation, Spirit Lake Tribe, Crow Creek Sioux, Lower Brule Sioux, Sisseton-Wahpeton Oyate, Yankton Sioux, Cheyenne-Arapaho Tribe, Fort Peck Assiniboine & Sioux Tribes.

2013-2014 Gemfield Project EIS. Conducting mediation as the cultural resource PI for Stantech and the Bureau of Land Management. The tribes involved include: Duckwater Shoshone, Yomba Shoshone, and Death Valley Timbisha Shoshone.

2011 Tongue River Railroad Project, Montana. Conducted for the Surface Transportation Board through the Tongue River Railroad. The tribes involved included the Cheyenne River Sioux, Crow Creek Sioux, Flandreau Santee Sioux, Ft. Peck Assiniboine and Sioux, Lower Brule Sioux, Northern Arapaho, Northern Cheyenne, Rosebud Sioux, Santee Sioux, Sisseton-Wapeton Oyate Sioux, Standing Rock Sioux, Three Affiliated Tribes, and Yankton Sioux.

2010 Florence Project, Arizona. Conducted for the Environmental Protection Agency through Curis Resources. The tribe involved was the Gila River Indian Community.

2004-2010 Windy Gap Firming Project, Loveland, Colorado. Conducted for the Bureau of Reclamation through ERO Resources, Inc. The tribes involved included the Apache Tribe of Oklahoma, Cheyenne and Arapaho Tribes of Oklahoma, Cheyenne River Sioux, Comanche Nation of Oklahoma, Crow Creek Sioux, Fort Sill Apache, Jicarilla Apache, Kiowa Tribe of Oklahoma, Mescalero Apache, Northern Arapaho, Northern Cheyenne, Northern Ute, Oglala Sioux, Pawnee Nation of Oklahoma, Rosebud Sioux, Shoshone (Eastern Band), Southern Ute, Standing Rock Sioux, and Ute Mountain Ute.

2000-2010 AT&T Nexgen/Core Project in Texas, New Mexico, Arizona and California. Conducted for the Bureau of Land Management through AT&T and P.F. Net. The tribes involved included the Apache of Oklahoma, Comanche of Oklahoma, Hopi, Kiowa, Mescalero Apache, Ysleta del Sur, Fort Sill Apache, San Carlos Apache, Ak-Chin, Cocopah, Colorado River Indian Tribes, Gila River Indian Community, Pascua Yaqui Tribe, Salt River Pima, Maricopa, San Carlos Apache, Tohono O'Odham, Tonto Apache, White Mountain Apache, Yavapai Prescott, Pueblo of Zuni, Fort Mohave, Fort Yuma Quechan (Arizona, New Mexico, Oklahoma, Texas).

2004-2007 Northern Integrated Supply Project, Loveland, Colorado. Conducted for the Bureau of Reclamation through ERO Resources, Inc. The tribes involved included the Apache Tribe of Oklahoma, Assiniboine and Sioux, Cheyenne River Sioux, Cheyenne and Arapaho Tribes of

	Oklahoma, Chippewa Cree, Comanche Nation of Oklahoma, Confederated Salish and Kootenai Tribes, Crow Creek Sioux, Crow Nation, Eastern Shoshone Tribe, Flandreau Santee Sioux, Fort Sill Apache, Gros Ventre and Assiniboine, Iowa Tribe of Kansas and Nebraska, Jicarilla Apache, Kickapoo Tribe of Kansas, Kiowa Tribe of Oklahoma, Lower Brule Sioux, Mni Sose Intertribal Water Rights, Northern Arapaho, Northern Cheyenne, Northern Ute, Oglala Sioux, Omaha, Otoe-Missouria Tribal Council, Pawnee Nation of Oklahoma, Ponca Tribes of Nebraska and Oklahoma, Prairie Band of Potawatomi, Rosebud Sioux, Sac and Fox Nations of Missouri and Mississippi, Santee Sioux, Shoshone (Eastern Band), Sisseton-Wahpeton Sioux, Southern Ute, Spirit lake Sioux, Standing Rock Sioux, Three Affiliated Tribes, Trenton Indian Service Area, Turtle Mountain Band of Chippewa, Ute Mountain Ute, Winnebago Tribe, and Yankton Sioux.
2001-2006	City of Reno, Nevada ReTrac Project. Conducted for City of Reno, Nevada Department of Highways and Federal Highways. The tribes involved included Washoe Tribe of Nevada and California, Pyramid Lake Paiute Tribe, and the Reno-Sparks Indian Colony.
2002	The Patrick Interchange Project EIS. Conducted for the FHWA through Ken Krater Consulting. The tribes involved included the Pyramid Lake Paiutes, the Washoe Tribe of Nevada and California, and the Reno/Sparks Indian Colony (Nevada).
2001	The Valley Auto Mall Interchange on I-515 Project. Conducted for FHWA through PBS&J. The tribes involved included the Moapa Band of Paiutes, Las Vegas Paiute Tribe, and the Las Vegas Urban Indian Center (Nevada).
2001	Lake Mead Drive Widening Project. Conducted for FHWA through HDR Engineering. The tribes involved included the Moapa Band of Paiutes, Las Vegas Paiute Tribe, and the Las Vegas Urban Indian Center (Nevada).
2000	Tonkin Mine Exploration Project. Conducted for the Bureau of Land Management through Tonkin Springs LLC. The tribe involved was the Western Shoshone (Nevada).
1999-2000	Expansion Area at Ski Cooper. Conducted for the USFS through Sno.engineering. The tribe involved was the Northern Ute Tribe (Colorado).
1999	Glamis Gold Imperial Project Gold Mine. Conducted for the Bureau of Land Management through Glamis Gold. The tribe involved was the Quechan (California).
1998	Nellis Air Force Base, Nevada. Conducted for the United States Air Force through Earth Tech. The tribes involved included the Las Vegas Paiute, the Southern Paiute Tribe (St. George, UT), the Western Shoshone (Ely, NV), and the Ft. Mohave (Colorado River).
1998	The Robinson Mine, Nevada. Conducted for the Bureau of Land Management through BHP Nevada Copper Company. The tribe involved was the Western Shoshone.
1998	The Fuller Lake Land Exchange, Nevada. Conducted for the Bureau of Land Management through CH2MHill. The tribe involved was the Washoe.
1997	The Cricket Mountain Data Recovery Project, Utah. Conducted for the Bureau of Land Management through Continental Lime. The tribes involved included the Kanosh Band, the Goshute, the Uintah and the Ouray.
1996-1997	The Cricket Mountain Expansion Tract A/B, Utah. Conducted for the Bureau of Land Management through Steffens, Robertson and Kirsten. The tribes involved included the Kanosh Band, the Goshute, the Unitah and the Ouray.
1996-1997	Pike=s Peak National Historic Landmark, Summit House, Colorado, Montana, New Mexico, Oklahoma, Utah and Wyoming. Conducted for the United States Forest Service and the National Park Service through Cliff Taylor, Architect. The tribes involved included the Southern Ute, Ute Mountain Ute, Jicarilla Apache, Cheyenne and Arapahoe of Oklahoma, Northern Arapahoe, Northern Arapaho Traditional Elders, Comanche, Eastern Shoshone, Northern Cheyenne, and the Ogalala Lakota Nation.
1996	The Round Mountain Environmental Assessment, Nevada. Conducted for the Bureau of Land Management through Round Mountain Gold. The tribe involved was the Western Shoshone.
1995-1997	The Adam=s Rib Recreational Area, Colorado. Conducted for the United States Forest Service through the Adam=s Rib Recreational Area. The tribes involved included the Southern Ute, Ute Mountain Ute, Uintah and Ouray.

1995	The Second Loop Project, New Mexico. Conducted for the Bureau of Land Management through El Paso Natural Gas Pipeline Company. The tribe involved was the Navaho Nation.
1995	The Florence Project, Arizona. Conducted for the Environmental Protection Agency through Magma Cooper. The tribes involved included the Salt River Community, the Ak Chin Community, the Tohono O'Odham Nation, the Gila River Indian Community, the Hopi Council and the Inter-Tribal Council.
1995	The Ruby Hill Project, Nevada. Conducted for the Bureau of Land Management through the Homestake Mining Company. The tribe involved was the Western Shoshone.
1994-1995	Cultural Resource Management Plan, Cyprus Tohono Mine, Arizona. Conducted for the Bureau of Land Management through the Cyprus Tohono Mine. The Tribes involved included the Tohono O'Odham and the Sif Oidak District.
1994-1995	Mine Interim Expansion, Data Recovery, Cyprus Tohono Mine, Arizona. Conducted for the Bureau of Land Management through the Cyprus Tohono Mine. The tribes involved included the Tohono O'Odham and the Sif Oidak District.
1994	Round Mountain Environmental Impact Statement, Nevada. Conducted for the Bureau of Land Management through Round Mountain Gold. The tribe involved was the Western Shoshone.

Publications:

2011	Making a Living in Private Sector Cultural Resource Management. Chapter 27 *In* A Companion to Cultural Resource Management (Blackwell Companions to Anthropology), Thomas F. King, ed. John Wiley and Sons Ltd, West Sussex, United Kingdom.
1986	Paleo-Environmental History of the Last 13,000 Years of the Eastern Powder River Basin, Wyoming, and Its Implications for Prehistoric Cultural Patterns. With Vera Markgraf. Plains Anthropologist, 31-111:1-12.
1985	Review of Archaeology of Colorado authored by Steve Cassells; Journal of Arctic and Alpine Research, Institute of Arctic and Alpine Research, University of Colorado, Boulder, June, 1985.

Professional Papers:

1994	Historic Mining Landscapes in the Western United States. With Dr. Don Hardesty and Dr. Steve Mehls, World Archaeology Conference, New Delhi India,
1988	Sites, Soils, and Paleoenvironment in the Upper Colorado River Valley. Paper presented at the 46th Annual Plains Conference, Wichita.
1988	Archaeological Investigations in Rio Abiseo National Park, Department of San Martin, Peru. Institute of Andean Studies Annual Meeting, Berkeley, California.
1985	The Remote Sensing Applications in the Rio Abiseo National Park, Peru. With Jane Wheeler and Tom Sever. American Anthropology Association Meetings, Washington, D.C.
1983	The Crisis in Cultural Resource Studies. Paper presented at Symposium on the Crisis in Cultural Resource Management, Society for Applied Anthropology, High Plains Region Section, Denver.
1982	Cultural Resource Study Approaches for the 1980s. Paper presented at the American Mining Congress, Denver.
1982	Pattern Analysis of Pre-Hispanic Raised Fields of Lake Titicaca, Peru. Paper prepared for the XLIV International Congress of Americanists, Manchester.
1979	An Archaeological Investigation of Raised Field Patterns, Lake Titicaca, Peru. Paper presented at the XLIII International Congress of Americanists, Vancouver.

Projects (Selected):

Since 1974, I have been involved in cultural resource management studies in the Western United States. Much of my experience has come as an archaeological consultant to federal, state, and industrial clients through Western Cultural Resource Management, Inc. (WCRM), a Boulder based corporation. Since 1978, WCRM has grown to become a highly recognized cultural resource consulting firm in the western United States. Studies have been conducted in Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Wyoming. I have managed numerous kinds of cultural resource projects including Environmental Assessments, Environmental Impact Statements (EISs), background and literature reviews, technical analyses of mine plans, sample surveys, intensive inventories, test excavations, mitigation data recovery plan development and mitigation projects. My professional staff size has ranged from 15-150 people, depending on the size and number of projects. In the past seven years, I have successfully managed annual budgets ranging from $5,000 to millions of dollars.

A brief summary of projects and reports follows. All cultural resource studies produced by Western Cultural Resource Management, Inc., have been completed under Federal Professional Services Antiquities Permits, issued to WCRM with Thomas J. Lennon as Principal Investigator.

2018	Eighth Street Bridge Study, City of Loveland, Larimer County, Colorado. Tasks include background research, field study, documentation, NRHP evaluation, and report. Lead Agency: Colorado Department of Transportation and City of Loveland; Client: LTE, Inc.
2017-Present	Fitzsimmons Veterans Hospital Monitoring Project, Adams County, Colorado. Tasks included background research, field monitoring of construction drilling, collection of paleontological remains found in drilling back dirt, submittal of inventory list and field collection to VA. Lead Agency and Client: Veteran's Administration.
2017- Present	Lake Powell Water Pipeline Project, Utah and Arizona. Tasks include review of existing cultural resource and ethnographic studies. Lead Agency: Federal Energy Regulatory Commission and Bureau of Land Management; Client: STANTEC
2017-2018	Montanore Mine Project, Lincoln Montana. Tasks included background research, field visit, project planning meetings. Lead Agency: USFS Kootenai National Forest; Client: Hecla Mining Company.
2017-2018	Kilgore Exploration Drilling Project, Clark County, Idaho. Tasks include background research, field study, documentation, NRHP evaluation, and report Lead Agency: US Forest Service, Targhee National Forest; Client: Klepfer Environmental.
2017-2018	Jackson Hole Airport Study, Teton County, Wyoming. Tasks included background research, field study, documentation, NRHP evaluation, and report. Lead Agency: National Park Service; Client: SEH, Inc.
2017	Mewbourne 3 Pipelines Project, Weld County, Colorado. Tasks include background research, field study, documentation, NRHP evaluation, and letter report. Client: Kleinfelder
2017	Granby Dam Study, Grand County, Colorado. Tasks included background research, field study, documentation, site testing, NRHP evaluation, and report. Lead Agency: Bureau of Reclamation; Client: Northern Colorado Water Conservancy District.
2017	Glenwood Springs Historic 27th Street Bridge Project, Garfield County, Colorado. Tasks included background research, field study, documentation, NRHP evaluation, and report. Lead Agency: Colorado Department of Transportation; Client: AMEC Foster Wheeler.
2017-2018	US 34 Wray Bridge Project, Yuma County, Colorado. Tasks include background research, field study, documentation, NRHP evaluation, and report. Lead Agency: Colorado Department of Transportation; Client: AMEC Foster Wheeler.
2017	Brighton Colorado Housing Project, Adams County, Colorado. Tasks included background research, field study, documentation, NRHP evaluation, and report. Lead Agency: City of Brighton Client: Brighton Housing LLC.
2016-Present	Florence Copper, Inc. In-Situ Copper Recovery Project Production Test Facility, Pinal County, Arizona. Florence Cooper, Inc. Tasks include mapping, testing, monitoring and data recovery of multiple sites. Federal Agency: Environmental Protection Agency, State Agency: Arizona State Land Department. Fieldwork began in 2016 and continues to present.
2016-Present	Southern Water Supply Project II Pipeline, Boulder and Larimer Counties, Colorado. ERO Resources Corporation and Northern Colorado Water Conservancy District. Tasks include Class I file search and Class III survey of 42 potentially jurisdictional waterway crossings (20.48 acres). A total of 46 resources were either revisited (n=34) or newly recorded (n=12).
2016-Present	Northern Integrated Supply Project (NISP). Tasks included Class I field check survey of the 1,250-acre Upper Galeton Reservoir; 20 sites were noted for the FEIS.

2016	New Raymer Gas Facility. Tasks included a proactive Class I COMPASS file search and field check of the New Raymer Gas Facility located in Weld County, Colorado and providing a map of the results to Noble Energy.
2015-Present	Long Canyon Mine Project, Goshute Valley, Elko County, Nevada. Newmont Gold Corporation. Study area: Approximately 24,750 acres. Tasks include construction monitoring and data recovery involving 100+ archaeological discoveries. Federal Agency: Bureau of Land Management. Fieldwork began in May of 2015 and has continues to present.
2003-Present	Southern Delivery System Reservoir Project, Colorado Springs-Pueblo, Colorado. Colorado Springs Utilities and MWH Americas Inc. Study area: approx. 25,000 acres. Tasks include intensive survey, reconnaissance, testing, Native American Consultation, preparation of EIS sections, preparation of approximately 47 reports, development of an Agreement Document and Mitigation Plan, and treatment of ten sites. Federal Agency: Bureau of Reclamation. Fieldwork began in January 2004 and has continued through 2014.
2013-2015	Treatment and Data Recovery at Six Sites, White Pine County, Nevada. Conducted for Robinson Nevada Mining Company. Tasks include treatment and data recovery plan preparation and implementation, archival research, excavation and final report preparation. Federal Agency: BLM-Ely District. Fieldwork was conducted in 2012-2013. The mitigation report was submitted in December 2015.
2012-2015	Bear Lodge Project, Wyoming. Conducted for Rare Elements Resources. Tasks include intensive survey, test excavations, geo-archaeological study, Native American consultation support, preparation of two reports, preparation of a Discovery Plan. Federal Agency: USFS Black Hills National Forest. Fieldwork began in September 2012 and was completed in September 2014.
2010-2015	McGuiness Hills Geothermal Project, Lander County, Nevada. Conducted for Ormat Technologies, Inc. Tasks include intensive surveys, preparation and implementation of a treatment plan, and preparation of 5 reports. Federal Agencies: Bureau of Land Management-Mount Lewis Field Office and USFS Humboldt-Toiyabe National Forest. The mitigation phase of the project was conducted between August 2011 and May 2013. The mitigation report was submitted in December 2015.
2012-2014	Hycroft Project, Pershing and Humboldt Counties, Nevada. Conducted for Allied Nevada Gold. Tasks include intensive survey, Native American Consultation support, preparation of EIS baseline sections, preparation and implementation of a mitigation plan and preparation of survey and draft mitigation reports. Federal Agency: Bureau of land Management-Black Rock Field Office. Fieldwork was conducted from May 2012 through May 2014. Working draft report submitted to BLM in February 2015.
2000-2010	AT&T Nexgen/Core Project in Texas, New Mexico, Arizona and California. Work conducted for AT&T/P.F. Net. Study area approx. 950 miles in length. Field work began in January 2000 and was completed in August 2004. Analysis and Report Preparation will continue for several years. Tasks include intensive surveys, testing, Native American Consultation, preparation of numerous survey reports, resource damage assessments, development of an Agreement Documents and Mitigation Plans, and preparation of Mitigation Reports. Federal Agency: Bureau of Land Management, National Park Service.
2001-2006	City of Reno, Nevada ReTrac Project. Work conducted for City of Reno. Study area of 2.2 miles of railroad corridor through downtown Reno. Field work began in January 2003 and ended in November 2004. Tasks include monitoring, testing, Native American Consultation, preparation of survey reports, development of an Agreement Document and Mitigation Plan, and preparation of Mitigation Reports. Federal Agency: Federal Highway Administration.
2002-2006	New Pueblo Freeway Project, Pueblo (Interstate 25), Colorado. Work conducted for CH2MHill and Colorado Department of Transportation. Study area approx. 12 miles in length. Field work began in January 2003, continued through 2004, 2005 and into 2006. As of January 2006, 1,008 historic and archaeological sites have been documented. Tasks include intensive surveys, testing, Native American Consultation, preparation of an 8,500-page survey report, development of an effects report, development of an Agreement Documents and Mitigation Plan. Federal Agency: Federal Highway Administration.

2003-2006	Windy Gap Firming Project, Northern Colorado. Work conducted for EDAW, ERO and Northern Colorado Water Conservancy District. Project began with a background review of 130 potential reservoir sites followed by intensive inventory of two potential reservoir sites and detailed assessment of two other alternatives Intensive fieldwork was conducted in 2003. Assessments have been ongoing since 2004. Tasks include intensive surveys, testing, preparation of two evaluation report and two survey reports. Federal Agency: Bureau of Reclamation.
2004-2006	Northern Integrated Supply Project, Northern Colorado. Work conducted for ERO and Northern Colorado Water Conservancy District. Project involves evaluation of three possible reservoir sites and related ancillary pipelines and facilities. Project is in preliminary assessment phase. WCRM has conducted field reconnaissance of three parcels in2004 and 2005. A technical report of findings has been prepared for two of the alternative reservoir sites and new information is being added regarding the third alternative. Tasks include records research, field reconnaissance, and preparation of Technical Memo. Federal Agency: U.S. Army Corps of Engineers.
2003	A Class III Cultural Resource Inventory of the Platte River Farm Project, Weld County, Colorado. Park Engineering Consultants. (Colorado).
2002	A Class III Cultural Resource Inventory of 18 Parcels Within the Northern Colorado Water Conservancy District Inclusion Project, Town of Superior, Boulder and Jefferson Counties, Colorado. Town of Superior, Utilities and Public Works Department. (Colorado).
2002	A Treatment Plan for Seven Sites within the Redmond Land Exchange, Huerfano County, Colorado. Michael J. Mollerus, LTD and the Bureau of Land Management, Canon City Field Office. (Colorado).
2002	A Class III Cultural Resource Report for the Black Mountain Project Located in the San Isabel National Forest, Custer and Huerfano Counties, Colorado. Weststaff USA, Inc. and Pike-San Isabel National Forest. (Colorado).
2001	A Class III Cultural Resources Inventory of the Proposed Site of the New Black Hawk/Central City Sanitation District Water Reclamation Plant, Gilpin County, Colorado. Black Hawk/Central City Sanitation District and U.S. Army Corps of Engineers. (Colorado).
2001	A Class III Cultural Resources Inventory of BLM Parcels in the Right of Way of the Proposed Southern Access Road for Central City, Gilpin County, Colorado. City of Central and the Bureau of Land Management, Canon City Field Office. (Colorado).
2001	A Class III Cultural Resources Inventory for the Elk Creek Lease Exploration Project, Delta and Gunnison Counties, Colorado. Oxbow Mining, Inc. and the USFS and Bureau of Land Management, October 2001. (Colorado).
2001	A Class III Cultural Resources Inventory of the Vista Pointe Subdivision, Weld County, Colorado. Simeon Communities, LLC and the Bureau of Reclamation. (Colorado).
2001	Historical Cultural Resources Study of the Idarado Mining Company Property in the Vicinity of Telluride, Colorado. Design WorkShop and the Idarado Mining Company. (Colorado).
2001	A Class III Cultural Resources Survey of the Wiggit Subdivision, Boulder County, Colorado. Gallery Homes and the Bureau of Reclamation. (Colorado).
2001	A Class III Cultural Resources Survey of the Pleasant Valley Reservoir, Larimer County, Colorado. Prepared for Northern Colorado Water Conservancy and the Bureau of Reclamation. (Colorado).
2001	A Class III Cultural Resources Survey of the Vista Ridge Subdivision, Weld County, Colorado. Simeon Communities and the Bureau of Reclamation. (Colorado).
2001	A Class III Cultural Resources Inventory of BLM Parcels in the Central City - Black Hawk Vicinity, Gilpin County, Colorado. Western Land Group and the Bureau of Land Management, Canon City Field Office. (Colorado).
2001	A Class III Cultural Resource Inventory of Golden=s Fredstrom Property, Boulder County, Colorado. Rocky Mountain Consultants. (Colorado).
2000	A Class III Cultural Resources Survey of The Roaring Fork Railroad Authority Environmental Impact Statement Glenwood Springs to Brush Creek Transportation Corridor, Eagle, Garfield, and Pitkin Counties, Colorado. Parsons Engineering and the Colorado Department of Transportation. (Colorado).

2000	A Cultural Resources Inventory for the Cricket Mountain Plant Amendment in Millard County, Utah. Bureau of Land Management, Fillmore Field Office. (Utah).
2000	Class III Cultural Resource Inventory for the North Douglas County Specific Plan Project, Carson City, Nevada. Lumos and Associates. (Nevada)
2000	A Treatment Plan for the Stoneman Grade Within the Proposed OMYA Superior Limestone Quarry Expansion Area, Tonto National Forest, Pinal County, Arizona. OMYA Arizona, Inc. (Arizona).
2000	Class III Cultural Resource Inventory for the Vista Ridge Project, Weld County, Colorado. Simeon Residential Properties. (Colorado).
2000	A NRHP Evaluation of A Stone Cabin Located in the Vista Point Subdivision South of Erie, Weld County, Colorado. Simeon Residential Properties. (Colorado).
2000	A Class III Cultural Resource Survey of the Oamek Subdivision in Erie, Weld County, Colorado. Sharon Oamek. (Colorado).
2000	A Class III Cultural Resource Survey of the Pleasant Valley Water Pipeline, Larimer County, Colorado. Northern Colorado Water Conservancy. (Colorado).
2000	An Addendum to A Class III Cultural Resource Survey of the Pleasant Valley Water Pipeline, Larimer County, Colorado. Northern Colorado Water Conservancy. (Colorado).
2000	A Cultural Resource Inventory of 11 Acres Near Bergen Park, Jefferson County, Colorado. Vision Land Consultation. (Colorado).
2000	A Historical Resources Survey of the Lower River Road in Pitkin County, Colorado. Colorado Department of Transportation. (Colorado).
2000	A Cultural Resource Inventory of 35 Acres Southwest of Erie, Boulder County, Colorado. RE/MAX. (Colorado).
2000	A Cultural Resource Inventory of 80 Acres West of Dacona, Weld County, Colorado. ERO Resources Corporation. (Colorado).
2000	A Class III Cultural Resource Survey of a Disturbed Area Along Apex Road in Gilpin County, Colorado. Gilpin County Planning Department. (Colorado).
2000	Historic American Engineering Record Study of the Lincoln Highway near Wendover, Nevada. National Park Service. (Nevada).
2000	A Class III Cultural Resource Survey of Proposed Pipeline Extensions in Larimer, Weld, Adams, Arapahoe, Douglass and El Paso Counties, Colorado. Colorado Interstate Gas and FERC. (Colorado).
2000	An Archaeological Survey of the New Mexico Portion of Link Two of the AT&T NEXGEN/CORE Project. PF.Net Construction Corporation. (New Mexico).
2000	An Archaeological Survey of Link Three of the AT&T NEXGEN/Core Project, Arizona and California. Land Services, Inc. (Arizona and California).
2000	Class III of the Second Alternate Post Office Location for Pinetop, Navaho County, Arizona. Maxim Technologies, Inc. (Arizona).
2000	Class III of Lowe Elevation Site Farms. Earthtec, Inc. (Nevada).
2000	Retrac Testing. Madcon-City of Reno. (Nevada).
2000	Class III of 1920 Acres. Getchell Gold. (Nevada).
2000	Survey, recordation and evaluation of the Riley Mine in Humboldt County, Nevada.
1999	A Class III Cultural Resources Survey of the Pratt Management Parcel Annexation, Weld County, Colorado. Town of Erie. (Colorado).
1999	A Class III Cultural Resources Survey of a Future Expansion Area at Ski Cooper. Sno Engineering and the Pike-San Isabel National Forest. (Colorado).
1999	A Class III Cultural Resources Survey of BLM Parcels in the Central City- Blackhawk Vicinity, Gilpin County, Colorado. Western Land Group, Proland and the Bureau of Land Management, Canyon City District Office. (Colorado).
1999	A Treatment Report for Historic Site CrNV-46-7404; Robinson Mining District, White Pine County, Nevada. Bureau of Land Management Ely District Office and BHP Copper Company. (Nevada).
1999	A Treatment Report For Historic Sites CrNV-46-7620 and 7623; Robinson Mining District, White Pine County, Nevada. Bureau of Land Management Ely District Office and BHP Copper Company. (Nevada).

1999 State Register of Historic Places Nomination, Glen Cove Lodge, Teller County, Colorado. City of Colorado Springs and the U.S. Forest Service, Pike National Forest. (Colorado).

1999 A Class III Cultural Resources Survey of the Neighbors/Redmond Property Project Area, Boulder County, Colorado. Rocky Mountain Consultants and Boulder County, Parks and Open Space. (Colorado).

1999 A Class III Cultural Resources Survey of the Graeagle Property, California. Sierra Pacific Power and Light. (California).

1999 Baseline Cultural Resource Inventory for the US 395/Clear Acre Lane Environmental Assessment. CH2MHill. (Nevada)

1999 Report of the Historic Mitigation Work at the Big Springs Ranch, Elko County, Nevada. Peskin and Associates and the Bureau of Land Management, Elko District Office. (Nevada).

1999 A Class III Cultural Resources Survey of the Honey Lake Extension, California. Sierra Pacific Power and Light. (California).

1999 A Class III Cultural Resources Survey of the Portions of the Caribou Ranch, Boulder County, Colorado. Caribou Ranch and Boulder County Parks and Open Space. (Colorado).

1999 A Class III Cultural Resources Survey of Portions of County Road 16, Gilpin County, Colorado. Gilpin County Planning Department and the U.S. Forest Service, Roosevelt National Forest. (Colorado).

1999 A Cultural Resources Inventory of Sprint Communication=s Reno Spur Fiber Optic Cable, Washoe County, Nevada and Lassen County, California. Sprint Communications and the Bureau of Land Management, Carson City District Office. (California, Nevada).

1999 A Class III Cultural Resources Survey of the Candlelight Ridge Project, Boulder County, Colorado. Town of Erie and Boulder County Parks and Open Space. (Colorado)

1999 A Class III Cultural Resources Survey of the Bell Tower Annexation, Weld County, Colorado. The Town of Erie. (Colorado).

1999 A Class III Cultural Resources Survey of Portions of the Cortez Mining District, Nevada. Bureau of Land Management, Battle Mountain District. (Nevada).

1999 Shafter, Texas Intensive Cultural Resource Survey of Selected Tailings Impoundment Parcels. EnviroNet and Rio Grande Resources, Inc. (Texas).

1999 A Class III Cultural Resources Survey of Portions of the Kuduz Coal Mine, Wyoming. Bureau of Land Management, Casper District. (Wyoming).

1999 A Class III Cultural Resources Survey of Portions of the Division of Mines and Geology Reclamation Project, Colorado. Bureau of Land Management, Canyon City, Colorado District. (Colorado).

1999 A Treatment Report For Historic Sites CrNV-46-7691 and 7694; Robinson Mining District, White Pine County, Nevada. Bureau of Land Management, Ely District Office and BHP Copper Company. (Nevada).

1999 Results of Data Recovery at the Boston-Ely Mine, White Pine County, Nevada. Bureau of Land Management, Ely District Office and BHP Copper Company. (Nevada).

1999 Data Collection at the Tererro Mine, San Miguel County, New Mexico. Ellis Engineering. (New Mexico).

1999 Testing of Two Sites along Phase II of Questar's Main Line 101, Sweetwater County, Wyoming. SWCA/Questar. (Wyoming).

1999 Class III of 4740 Acres for Coal Gas Production, Campbell County, Wyoming. Coleman Oil and Gas. (Wyoming).

1999 Class III of an alternate Post Office Location for Pinetop, Navajo County, Arizona. Maxim Technologies, Inc. (Arizona).

1999 Class III of the Electric Transmission Line Right-of Way to the Howell D2A Well Location, San Juan County, New Mexico. City of Farmington. (New Mexico).

1999 Class III of the Proposed Pinetop Main Post Office Site, Pinetop, Navajo County, Arizona. Maxim Technologies, Inc. (Arizona).

1999 Class III of the Proposed Congress Main Post Office Site, Congress, Yavapai County, Arizona. Maxim Technologies, Inc. (Arizona).

1999 Data Recovery at Four Sites in Washoe County, Nevada. BHP Copper. (Nevada).

1998-1999	Testing of 5MR636, Morgan County, Colorado. Northern Colorado Water Conservancy District - Ft. Morgan Pipeline. (Colorado).
1998-1999	Testing of Nine Sites along Questar Main Line 101, Sweetwater County, Wyoming. SWCA/Questar. (Wyoming).
1998	A Treatment Report for The Historic Mineral Ridge Mining District, Esmeralda County, Nevada. Bureau of Land Management, Tonopah Field Office and Mineral Ridge Resources, Inc. (Nevada).
1998	An Investigation into the Possible Plaster Grave Site, Broomfield, Colorado. Community Development, L.L.C. (Colorado).
1998	A Class III Inventory of the Summit of Pikes Peak, El Paso County, Colorado. Clifford Taylor Architects, the City of Colorado Springs and the U.S. Forest Service, Pike National Forest. (Colorado).
1998	A Cultural Resources Reconnaissance of the Hay Meadows Parcels in Eagle County, Colorado, for the Adam's Rib Recreational Area. Adam's Rib Recreational Area. (Colorado)
1998	A Treatment Plan for Historic Site LA89884, San Miguel County, New Mexico. Cypress Amax and Ellis Environmental Engineering. (New Mexico).
1998	Cultural Resource Inventory of the Southern Water Supply Project, Morgan Pipeline, Morgan and Weld Counties, Colorado. Bureau of Reclamation and Northern Colorado Water Conservancy District. (Colorado).
1998	A Class III Cultural Resources Survey and Management Plan for the Sandstone Ranch, Weld County, Colorado. The City of Longmont, Parks and Open Space Department and Winston Associates. (Colorado).
1998	A Treatment Report for The Historic Mitchell School, Golden, Jefferson County, Colorado. The Golden Urban Renewal Authority and the Golden Planning Department. (Colorado).
1998	A Cultural Resource Inventory of the Browns Canyon, Eureka County, Nevada. S. R. K. and the Bureau of Land Management, Battle Mountain District. (Nevada).
1998	The BHP Conglomerate Mesa Project, Inyon County, CA. BHP Minerals International and the Bureau of Land Management, Ridgecrest District Office. (California).
1998	A Class III Cultural Resources Survey Report for Portions of the Nevada Northern Railway (Kennecott) Tracks and Roadbed From Milepost 74.5 to Milepost 18.6 in Elko County, Nevada. BHP Railroad Company, Robinson Project and the Bureau of Land Management, Elko District Office. (Nevada).
1998	An Assessment of Sources Available and Recommendations for the Preparation of a History of the Getchell Mine, Humboldt County, Nevada. Getchell Gold Mining Company. (Nevada).
1998	A Class III Cultural Resources Survey of the CAMAS Mine Property, Sandstone Ranch, Weld County, Colorado. SRK Consulting Engineers and the Colorado Division of Mines and Geology. (Colorado).
1998	Class III of the proposed Science Center Expansion at Fort Lewis College in Durango, La Plata County, Colorado. Fort Lewis College. (Colorado).
1998	Class III of the proposed Center of Southwest Studies at Fort Lewis College in Durango, La Plata County, Colorado. Fort Lewis College. (Colorado).
1998	Class III of the proposed Corrales Post Office Site, Sandoval County. Maxim Technologies, Inc. (New Mexico).
1998	Class III of a proposed road and transmission line for the Iron Basin Limestone Quarry Operation Millard County. Continental Lime. (Utah).
1997	Archaeological Survey at Nellis Air Force Base, Phases 1, 2, 3, and 4. Earth Tech, Inc. (Nevada).
1997	A Cultural Resource Inventory of Browns Canyon, Eureka County, Nevada. Steffen, Robertson and Kirsten (SRK) and the Bureau of Land Management. (Nevada).
1997	A Final Report of a Class III Inventory of the Cricket Mountain Quarry Expansion, 1996. Continental Lime, Inc. (Utah).
1997	An Archaeological Inventory of 33 Acres of Land Including the Deep Ruth Shaft Complex and the Kennecott Shop Complex for the BHP Robinson Project White Pine County, Nevada. BHP Copper Company. (Nevada).
1997	The BHP Conglomerate Mesa Exploration Project: Archaeological Survey in the Southern Inyo Mountains, Inyo County, California. BHP Minerals International. (California).

1997	A Class III Inventory of the Summit of Pikes Peak, El Paso County, Colorado. Clifford Taylor Architects and the City of Colorado Springs. (Colorado).
1996	A Class III Cultural Resource Inventory of a 120 Acre Parcel in Owens Valley, Inyo County, California. UMETCO Minerals Corporation. (California).
1996	Cultural Resources Treatment Plan for Seven Sites in the BHP Copper Company=s Florence in Situ Mine, Pinal County, Arizona: Phase II Data Recovery. BHP Copper, Inc. (Arizona).
1995	Hayden Hill Data Recovery Report, Hayden Hill Mine Project, Lassen County, California. Lassen Gold Mining, Inc. (California).
1995	A Class III Cultural Resources Inventory of 939 Total Acres of the Cresson Project Teller County, Colorado. Cripple Creek and Victor Gold Mining Company. (Colorado).
1995	Data Recovery Report of Lockwood Stage Station at the Pinyon Canyon Maneuver Site, Las Animas County, Colorado. National Park Service. (Colorado).
1995	Addendum to a Class III Inventory of the Radcliff Project Area, Panamint Mountains, Inyo County, California. Compass Minerals, Inc. (California).
1995	An Archaeological File Search and Field Reconnaissance for the Cold Spring Valley Project, Washoe County, Nevada. Western Resource Management. (Nevada).
1995	An Archaeological Inventory of the Magma Robinson Project Proposed Mine Dump Expansion, White Pine County, Nevada. Magma Nevada Mining Co. (Nevada).
1995	An Archaeological Inventory of the Magma Robinson Project Proposed Perimeter Fence, White Pine County, Nevada. Magma Nevada Mining Co. (Nevada).
1995	A Class III Cultural Resource Inventory of Briggs Discovery Site #1 (BDS-1) Inyo County, California. Canyon Resources, Inc. (California).
1995	A Treatment Plan for a Contributing Element of the Nevada Northern Railroad (CrNV-46-546) White Pine County, Nevada. Magma Nevada Mining Co. (Nevada).
1995	Archaeological Monitor and Discovery Plan for the Las Vegas Paving Corporation's Sunridge Project, Douglas County, Nevada. Las Vegas Paving Corporation. (Nevada).
1995	A Data Recovery and Treatment Plan for Sites in the Las Vegas Paving Corporation Sunridge Project, Douglas County, Nevada. Las Vegas Paving Corporation. (Nevada).
1994	A Class III Cultural Resource Inventory of a 13 Mile Power line Right-of-Way, White Pine County, Nevada. Placer Dome U.S. Bald Mountain Mine. (Nevada).
1994	A Plan to Perform Data Recovery at Site CrNV-46-7407, White Pine County, Nevada. Magma Copper Company. (Nevada).
1994	A Plan to Perform Data Recovery on Site 5TL464, Teller County, Colorado. Cripple Creek & Victor Gold Mining Company. (Colorado).
1994	Letter Report on the Results of Additional Shovel Test Probes on Site 5TL464, Teller County, Colorado. Cripple Creek & Victor Gold Mining Company. (Colorado).
1994	A Class III Cultural Reources Inventory of the Prehistoric Resources in Arequa Gulch Teller County, Colorado. Cripple Creek & Victor Gold Mining Company. (Colorado).
1994	A Plan to Perform Surface and Subsurface Evaluation and Potential Data Recovery at Site 26Do239, Douglas County, Nevada. Las Vegas Paving Corporation. (Nevada).
1994	A Class III Cultural Resources Inventory of Six Prospective Open Pit Sites for American Pozzolan Corporation Near Hallelujah Junction, Lassen County, California. American Pozzolan Corporation. (California).
1994	A Cultural Resource Survey of 2125 Acres for the Santa Fe Pacific Dry Hills Pass Project, Humboldt County, Nevada. Santa Fe Pacific Mining. (Nevada).
1994	A Class III Cultural Resource Inventory of the Briggs Project Expansion, Inyo County, California. Canyon Resources Corporation. (California).
1994	Class III Cultural Resource Inventory of 18 Parcels and NRHP Evaluations of 25 Previously Recorded Sites For the Magma Robinson Project White Pine County, Nevada. Magma Nevada Copper. (Nevada).
1994	Riepetown: A Data Recovery Report for the Historic Townsite of Riepetown White Pine County, Nevada. Magma Nevada Copper. (Nevada).

1994	National Register Evaluation and Damage Assessment of Site 26CH1040 for Naval Air Station Fallon, Churchill County, Nevada. Prepared for Commander, Western Division Naval Facilities Engineering Command. (Nevada).
1994	A Class III Cultural Resource Inventory of the Proposed Repeater Facility Site for Canyon Resources Inc., Inyo County, California. Canyon Resources, Inc. (California).
1994	A Class III Cultural Resource Inventory of Two Potential Clay Sources for Canyon Resources Inc., Inyo County, California. Canyon Resources, Inc. (California).
1993	Archaeological Survey of the Proposed LGMI Basalt Quarry and Associated Access Roads, Lassen County, California. Lassen Gold Mining, Inc. (California).
1993	A Class III Cultural Resource Inventory of 2.8 miles of Access Road and Drill Pad Site for the Anschutz Corporation Troy Canyon Project Christian Spring Federal #11-3 Nye County, Nevada. Anschutz Corporation Denver, Colorado. (Nevada).
1993	Class III Cultural Resource Inventory of the Historic Townsite of Tenabo for AMAX Gold Exploration, Inc. (Nevada).
1993	Class III Cultural Resource Inventory of Golden Sunlight Mine. Golden Sunlight Mines. (Nevada).
1993	Class III Cultural Resource Inventory of 18 Parcels and NRHP Evaluations of 25 Previously Recorded Sites for the Magma Robinson Project, White Pine County, Nevada. Magma Nevada Copper, Inc. (Nevada).
1993	Mitigative Excavation and Data Recovery of Sites 26WP2412 and 26WP2874, White Pine County, Nevada. Magma Nevada Copper, Inc. (Nevada).
1993	Class III Cultural Resource Inventory of the Historic Townsite of Riepetown, White Pine County, Nevada. Magma Nevada Copper, Inc. (Nevada).
1992	Paleontology Reconnaissance of the West Black Thunder Mine Maintenance Tract, Wright County, Wyoming. Thunder Basin Coal Company. (Wyoming).
1992	Paleontology Inventory and Survey of the Limestone-Gering-McGrew Power Transmission Line, Wyoming and Nebraska. USDOE - Western Area Power Administration. (Wyoming and Nebraska).
1992	Class III Cultural Resource Inventory of the Historic Townsite of Riepetown, White Pine County, Nevada. Magma Nevada Copper. (Nevada).
1992	Class III Cultural Resource Inventory of Bald City and Rat Haul Road Site/Bald Mountain Mine Project, White Pine County, Nevada. (Nevada).
1992 - 1993	Mitigative excavation of the Riepetown Site in White Pine County, Nevada. Magma Nevada Copper. (Nevada).
1992	Class III Cultural Resource Inventory of the Proposed North Springs Estates Development, Washoe County, Nevada. North Valleys Consultants, North Springs Estates. (Nevada).
1992	Class III Cultural Resource Inventory of the USMX Horseshoe/Galaxy Project, White Pine County, Nevada. USMX, Horseshoe/Galaxy Project. (Nevada).
1992	Archaeological Reconnaissance of a Parcel of Land in Larimer County for the Eagle Rock School Land Transfer, Larimer County, Colorado. (Colorado).
1992	Riepetown Data Recovery Plan Robinson Mine Project, White Pine County, Nevada. Magma Nevada Copper. (Nevada).
1992	Report on Cultural Resources for the Snowmass Environmental Impact Statement, Pitkin County, Colorado. Cogan Sharpe Cogan, Snowmass EIS. (Colorado).
1992	Class III Cultural Resource Inventory of the Independence Mining Company, Jerritt Canyon Project. (Nevada).
1992	Plan for testing of Archaeological Site 5LR42. (Colorado).
1991	Cultural Resource Inventory on the Phase II Portion of the USMX Yankee Project, White Pine County, Nevada. (Nevada).
1991 - 1992	Cultural Resource Inventory On the Phase I Portion of the USMX Yankee Project, White Pine County, Nevada. (Nevada).
1991	Class III Cultural Resource Inventory of Newmont Gold Company South Operations Area, Elko County, Nevada. Newmont Gold Company, Newmont Mine. (Nevada).
1989	Cultural Resource Inventory of the Coeur-Rochester Waver Saddle Area, Pershing County, Nevada. (Nevada).

1989	Class III Cultural Resource Inventory of the Lowry Landfill, Arapaho County, Colorado. (Colorado).
1989 - 1990	Class III Cultural Resources Inventory of Sleeper Mine Wetlands Enhancement Project, Humboldt County, Nevada. Inventory of 2,220 acres of federal property for wetlands development project. Lead Agency: Bureau of Land Management. (Nevada).
1988 - 1990	Bodie Townsite Cultural Resource Project. Literature and archival research on historic townsite area and National Historic Landmark (National Park Service) in Mono County, California. Lead Agency: Bureau of Land Management. (Nevada).
1988 - 1990	Copperton Townsite Data Recovery Project. Mitigation of impacts to historic townsite in Carbon County, Wyoming. Lead Agency: National Park Service/Federal Highway Administration. (Wyoming).
1988	Cultural Resource Inventory of Willard Mine Project. Survey and Environmental Assessment of cultural resources located within 600 acre proposed mine permit boundary. Lead Agency: Bureau of Land Management. (Nevada).
1988 - 1990	Wind Mountain Data Recovery Project. Mitigation of impacts to portion of National Register Historic District in Washoe County, Nevada. Lead Agency: Bureau of Land Management. (Nevada).
1988 - 1990	Cultural Resource Inventory of Portion of Forest Highway 20, Routt County, Colorado. Survey of historic and prehistoric sites along 6 miles of highway in national forest. Lead Agency: National Park Service/Federal Highway Administration. (Colorado).
1988 - 1990	Lake Range Quarries Data Recovery Project. Mitigation of impacts within a National Register District prehistoric chert quarry located in Washoe County, Nevada. Lead Agency: Bureau of Land Management. (Nevada).
1988	Cultural Resource Inventory of Excess Federal Property in Morgan County, Colorado. Cultural resource inventory of 600 acres of federal land. Lead Agency: Bureau of Reclamation. (Colorado).
1988	Cultural Resource Inventory of Expansion of Front Range Airport, Adams County, Colorado. Cultural resource inventory of historic and prehistoric sites within planned airport expansion area. Lead Agency: Federal Aviation Administration. (Colorado).
1988 - 1990	Class III Cultural Resource Inventory of Hayden Hill Project, Lassen County, California. Inventory of 4,200 acres of federal and private property for gold mine development. Lead Agency: Bureau of Land Management. (California).
1987	Archaeological Data Recovery at Sites 48LN529, 48LN1674 and 48LN1685, Lincoln County, Wyoming. Excavation of three Archaic sites in pipeline right of way. Lead Agency: Bureau of Land Management. (Wyoming).
1987	Quail Mountain Ski Resort Cultural Resource Studies, Lake and Chaffee Counties, Colorado. Inventory of 4000 acres. Survey recorded 65 sites; preparation of EIS sections. Lead Agency: USDA-Forest Service. (Colorado).
1987 - 1988	Lake Catamount Ski Resort Project, Routt County, Colorado. Inventory of 6000 acres recording 37 sites and testing nine. Sections of the EIS were also prepared. Lead Agency: USDA-Forest Service. (Colorado).
1987 - 1988	Kremmling Tap-Windy Gap Substation Project, Grand Colorado. Transmission line project involving survey, testing and preparation of draft EIS sections. Lead Agency: Department of Energy. (Colorado).
1987	Phase I and II Mitigation Program for ARCO Black Thunder Coal Company, Wright, Wyoming. Archaeological data recovery at three prehistoric sites in eastern Powder River Basin, Wyoming. Lead Agency: Office of Surface Mining. (Wyoming).
1987 - 1988	Craig-Bonanza 345kV Transmission Line EIS Project. Transmission line in northeastern Utah and northwestern Colorado, cultural resource planning, field work and reporting on over 100 miles of line. Lead Agency: Department of Energy. (Colorado and Utah).
1984 - 1985	Employee Awareness Program for Cultural Resources, ARCO Black Thunder Mine, Wright, Wyoming. Consultant to coal mine for the development of a multi-media training program for cultural resource protection. Lead Agency: Office of Surface Mining. (Wyoming).
1984	Keystone Ski Resort Cultural Resource Studies. Two small inventories totaling 375 acres; eight historic sites recorded and evaluated. (Colorado).

1984 - 1985	Phase I Mitigation Program Report for ARCO Black Thunder Coal Company, Wright, Wyoming. Preparation of report on excavations at five aboriginal sites in eastern Wyoming. Lead Agency: Office of Surface Mining. (Wyoming).
1984	Mitigation of Cultural Resources at the Exxon La Barge Project Plant Site, Sweetwater County, Wyoming. Large-scale excavation of Archaic sites and burials in sand dune field; numerous small surveys; development of data recovery plan. Field crew of over 50 archaeologists. Lead Agency: Bureau of Land Management. (Wyoming).
1984	Test Excavation at 5GA752, Grand County, Colorado. Subsurface evaluation of an aboriginal lithic scatter located at 10,400 feet. (Colorado).
1984	Paleontological Resource Inventory, Neil Butte Coal Company, Keeline Project, Wright, Wyoming. Sample Inventory of 7,500 acres resulting in location of one paleontological site containing fossils of two species of amphibious reptiles. (Wyoming).
1984	Paleontological Study for the Windy Gap Pipeline Project, Grand County, Colorado. Paleontology study along approximately 5 miles of pipeline corridor. (Colorado).
1984 - 1985	Phase II Mitigation Plan Development for Cultural Resources at ARCO Black Thunder Mine, Wright Wyoming. Evaluation of Phase I testing program results and preparation of final phase of data recovery at five significant aboriginal sites. Lead Agency: Office of Surface Mining. (Wyoming).
1984	Phase II Mitigation Program Report for ARCO Black Thunder Coal Company, Wright, Wyoming. Preparation of Phase II Mitigation Plan based on 1984 fieldwork; further excavation on four aboriginal sites. (Wyoming).
1984 - 1985	Mitigation Plan Development for AMAX Belle Ayre Coal Mine Gillette, Wyoming. Evaluation of field documentation for 38 prehistoric and historic sites for the National Register of Historic Places; preparation of a mitigation plan for protection of significant cultural resources. Lead Agency: Office of Surface Mining. (Wyoming).
1984	Cultural Resource Survey and Test Excavation Program. Neil Butte Coal Company, Keeline Project, Wright, Wyoming. Inventory of 2420 acres, re-recorded and evaluated eight previously located sites, recorded and evaluated of 15 previously unrecorded sites, and test excavated four sites. (Wyoming).
1984 - 1987	The Blue River - Gore Pass Project: A Class III Cultural Resource Inventory and Testing Program Along A Proposed Transmission Line in Grand and Summit Counties, Colorado. Multi-phased project with over 130 cultural resources. Survey, testing and monitor, preparation of draft EIS sections. Lead Agency: Department of Energy. (Colorado).
1983	Cultural Resources Protection and Utilization Plan for the ARCO Black Thunder Mine, Wright, Wyoming. Review of existing cultural resource studies within coal lease, evaluate documents for compliance, and preparation of resource protection and mitigation plan for mine. (Wyoming).
1983	Cultural Resource Evaluation of a Multi-component Quarry and Campsite (5CF84), Pike and San Isabel National Forests, Colorado. Sample mapping and test excavations of an extensive prehistoric site; development of a resource protection plan. (Colorado).
1983 - 1984	Cultural Resource Inventory of U.S. Department of Agriculture Forest Service Properties in Black Hills National Forest, South Dakota and Wyoming. Sample survey and intensive survey of portions of 45,000 acres; 34 historic and prehistoric sites were recorded and evaluated; three sites were test excavated. (South Dakota and Wyoming).
1983	Cultural Resource Inventory, Neil Butte Coal Company, Campbell County, Wyoming. Inventory of 1,600 acres for prehistoric and historic resources; 16 sites were recorded and three were test excavated. (Wyoming).
1983	Paleontological Evaluation of the Echeta Mine, Campbell County, Wyoming. Survey by paleontologist and evaluation of paleontological resources. Fossil mammal taxa located that were previously unidentified in the eastern Power River Basin; mammal teeth identified as the rodent Paramys sp., a primitive arctocyonid, possibly a new species. (Wyoming).
1983	Cultural Resource Inventory on a Forest Service Land Exchange, Grand County, Colorado. Survey of 1,720 acres in Arapaho National Forest; six sites were recorded and evaluated. (Colorado).
1983 - 1984	Gettys-Cities Service Oil Shale Environmental Impact Statement. Preparation of EIS document for Camp Dresser and McKee, Denver, Colorado for submission to the U.S. Corps of Engineers,

	Sacramento, California; required review of an pertinent studies for project and immediate region, discussion of cultural resource background, review of potential impacts to resources, and development of mitigation measures.
1983	Survey and Test Excavation for the Exxon La Barge Project, Sweetwater County, Wyoming. Cultural resource Inventory and test excavations in previously unstudied sand dune field in southwestern, Wyoming. Field crew totaled 35 archaeologists. (Wyoming).
1983	Environmental Assessment of the Grand Junction Conversion Transmission Line Project, Grand Junction, Colorado. Preparation of cultural and paleontological resource sections of environmental assessment, review of local literature, reconnaissance of proposed transmission corridors, evaluation of impacts, and development of mitigation measures. (Colorado).
1982 - 1983	Archaeological Investigations at the North Antelope Mine, Eastern Powder River Basin, Wyoming. Inventory of 3,800 acres located 108 prehistoric and historic sites; 63 sites were significant and eligible to the National Register of Historic Places. The North Antelope Archaeological District was created and served as the framework for developing and implementing a multi-year mitigation plan. (Wyoming).
1982	Development of a Data Recovery Plan for the Dave Johnston Coal Mine, Converse County, Wyoming. Preparation of a mitigation data recovery plan for an 11,200 acre coal mine. Cultural resources included 67 prehistoric and historic sites as well as 58 isolated artifacts. (Wyoming).
1981	Cultural Resource Study of the Yoast Coal Lease, Routt County, Colorado. Inventory of 1,413 acres located four archaeological sites and four isolated artifacts. (Colorado).
1981	Mobil Oil Company Parachute Oil Shale Cultural Resource Baseline Environmental Impact Study, Garfield County, Colorado. Inventory of 4,000 acres located 21 archaeological sites. (Colorado).
1981	Cultural Resource Study of Welch No. 1-North Mine, Access Road and Railroad Corridor, Sheridan County, Wyoming. Cultural resource study 500 acres located archaeological sites. (Wyoming).
1981	Cultural Resource Baseline Studies for the Chokecherry Project, Moffat County, Colorado. Study of 120 acres located one archaeological site. (Colorado).
1981	North Antelope Mine Mitigation Project, Campbell County, Wyoming. This project consisted of mitigation plan development, Phase 1 test excavation of 108 sites, analysis, and report preparation. (Wyoming).
1981	Cultural Resource Evaluation of the Superior Oil Shale Property, Garfield County, Colorado. Literature review and field reconnaissance of 8,000-acre project area for project feasibility study. (Colorado).
1980	Archaeological Study of the Red Butte Stone Circle Site (48CO26) Near Glenrock, Wyoming. A unique site containing 91 stone circles was recorded and evaluated for the National Register of Historic Places. A site protection plan was developed with the Office of Surface Mining and NERCO, Inc. in order to avoid impact due to coal mine development. (Wyoming).
1980	Cultural Resource Study of Butcher knife Draw Coal Project, Routt County, Colorado. Survey of 640 acres. (Colorado).
1980 - 1981	Environmental Baseline Studies for the Anaconda Stillwater Project, Stillwater County, Montana. Study of 5,041 acres located 38 archaeological sites and 40 isolated artifacts. (Montana).
1980	Cultural Resource and Paleontological Resource Inventory of the Antelope Coal Mine, Converse County, Wyoming. Inventory of 8,000 acres of federal coal lease led to the recordation and evaluation of 98 prehistoric and historic sites and 90 isolated artifacts; development of resource management plan for the life of the mine. (Wyoming).
1980	Cultural Resource and Paleontological Resources Inventory of Dave Johnston Coal Mine, Converse County, Wyoming. Cultural resource recording and evaluation on an 11,200 acre coal mine in eastern Wyoming; 67 prehistoric and historic sites identified as well as 58 isolated artifacts. (Wyoming).
1979	Investigation of Effects of Blasting on Cultural Resources. Report prepared from literature review and correspondence with national and international experts to develop an understanding of the effects of blasting on various kinds of cultural resources. Funded by the Federal Office of Surface Mining, Denver, Colorado.

1979 - 1981 Technical Review of Mine Plans for U.S. Department of the Interior Office of Surface Mining. Review and analysis of cultural resource studies on 17 Western states coal mines in order to assess studies for compliance with Federal regulations. (17 Western States).

1979 Windy Gap, Water Diversion Project, Archaeological Survey and Testing Program, Grand County, Colorado. Survey and test excavation in high mountain valley (8,000 feet). Survey identified high archaeological site density; additional study identified as Early Archaic settlement, dating to 7980 ∀ 120 B.P. (Colorado).

1979 Cultural Resource Inventory of Seneca Coal Mine, Routt County, Colorado. Survey of 5,000 acres located seven archaeological sites. (Colorado).

1979 Cultural Resource Study of Union Carbide Prospect, Medicine Bow National Forest, Wyoming. Survey of 232 acres. (Wyoming).

1979 Cultural Resource Inventory of Seneca II-West Coal Lease, Routt County, Colorado. Survey of 3,200 acres located 10 archaeological sites, included evaluation of resource potential within one-mile buffer around mine; test excavation of 5RT139. (Colorado).

1979 - 1980 Cultural Resource Studies for AMAX Mt. Emmons Project. Development of a predictive sample survey within potential transmission corridors. Survey of sample areas proposed, residential areas, and tailings sites. Recording and evaluation of resources within a 188 square mile study area, 18,000 acres surveyed, 186 prehistoric and historic sites located. (Colorado).

1979 Cultural Resource Study of American Selco Prospect, Medicine Bow National Forest, Wyoming. Survey of 90 acres located two historic sites. (Wyoming).

1978 Cultural Resource Inventories for U.S. Department of Agriculture-Forest Service Habitat Improvement and Timber Sale Projects. Survey of 2,101 acres located four archaeological sites and four isolated artifacts. (Colorado).

<u>Other Experience (Selected)</u>:

1975 - 1976 Alaska Natural Gas Pipeline Environmental Impact Statement Project; Denver and Washington, D.C. Technical advisor on archaeological and cultural resources for the Department of the Interior-National Park Service during draft review and final preparation of the Alaska Natural Gas Environmental Impact Statement. Duties included editing, writing, contact with State Historic Preservation officers concerning impacts and development of mitigation measures.

1975 U.S. Department of Agriculture-Forest Service Routt National Forest, Routt County, Colorado. Field archaeologist in cultural resource reconnaissance of 50,000 acres of forest in northern Colorado.

1975 Jones-Miller Paleo-Indian Site, Eastern Colorado. Field archaeologist for Smithsonian Institution excavation of a Hell Gap type Paleo-indian bison kill.

1974 - 1975 Two Forks Archaeological Projects, Jefferson County, Colorado. Rocky Mountain Foothills Survey and Test Excavation along South Platte drainage. Research Assistant, Crew Leader (12 months), University of Colorado Department of Anthropology under contract to the National Park Service.

1971 - 1973 Human Settlements Study. Analysis of effects of suburban growth on rural setting in Rockland County, New York. Study at the Athens Center for Ekistics (Human Settlement Research) in conjunction with M.A. Program at Fairfield University, Fairfield, Connecticut.

<u>Reports (Selected)</u>:

Brockway, Rocky, Geoffrey Cunnar, Jay Johnson, Thomas J. Lennon, Steven F. Mehls, Jackson Mueller, Jaclyn Raley, Mary Ringhoff, Edward J. Stoner, and Charles W. Wheeler

2013 <u>The Archaeology of Five Sites (CRNV-61-8850, CRNV-61-8851, CRNV-61-8866, CRNV-61-8878, and CRNV-61-14961) along Shoshone Creek in the Round Mountain Mining District, Nye County, Nevada</u>. Unpublished Report prepared on file at the BLM Battle Mountain District Office, Battle Mountain, Nevada.

Burney, Michael S. and Thomas J. Lennon

1979 <u>A Report on the Identification of Existing Cultural Resource Information within the AMAX Utility Corridor Study Area, Gunnison County, Colorado</u>. Prepared by Western Cultural Resource Management, Inc. for Camp Dresser and McKee, Denver, Colorado, for submission to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

Burney, Michael S., Carol Coe, Collette Colle and Thomas J. Lennon
1979 An Archaeological Study of the Aboriginal Sites within the Windy Gap Dam, Reservoir and Pipeline Project, Grand County, Colorado. Prepared by Western Cultural Resource Management, Inc. for Northern Colorado Water Conservancy, Loveland, Colorado and submitted to the U.S. Department of the Interior, Bureau of Reclamation, Denver, Colorado.

Burney, Michael S., Thomas J. Lennon and M. Sullivan
1979a A Cultural Resource Inventory of the Big A. Basin Habitat Improvement Area, Uncompahgre National Forest, Colorado. Prepared by Western Cultural Resource Management, Inc. for and submitted to the U.S. Department of Agriculture-Forest Service Rocky Mountain Region, Denver, Colorado.

1979b A Cultural Resource Inventory of the Black Mesa Habitat Improvement, Gunnison National Forest, Colorado. Prepared by Western Cultural Resource Management, Inc. for and submitted to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

1979c A Cultural Resource Inventory of the Lone Cabin Habitat Improvement, Gunnison National Forest, Colorado. Prepared by Western Cultural Resource Management, Inc. for and submitted to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

1979d A Cultural Resource Inventory of the South Black Timber Sale, Gunnison National Forest, Colorado. Prepared by Western Cultural Resource Management, Inc. for and submitted to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

1979e A Cultural Resource Inventory of the West Muddy Timber Sale, Gunnison National Forest, Colorado. Prepared by Western Cultural Resource Management, Inc. for and submitted to the U.S. Department of agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

Burney, Michael S., Thomas J. Lennon, M. Sullivan, and Charles W. Wheeler
1979 A Cultural Resource Inventory of the Highlands Ranch. Prepared for Jack G. Raub Company and Mission Viejo Company. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Carrillo, Richard F., Collette C. Chambellan and Thomas J. Lennon
1996 A Summary Report of a Historical Archaeology Survey Conducted at the Piñon Canyon Maneuver Site, Las Animas County, Colorado During the Summer of 1993. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for the Rocky Mountain Regional Office of the National Park Service for the Department of the Army, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Chambellan, Collette C., M. Kadziel, Thomas J. Lennon, and E.K. Wade
1984 A Cultural Resource Evaluation of a Multi-Component Quarry and Campsite (5CF84), Salida Ranger District, Pike and San Isabel National Forests, Colorado. Prepared by Western Cultural Resource Management, Inc., for the U.S. Department of Agricultural-Forest Service, Pueblo, Colorado.

Chambellan, Collette C., and Thomas J. Lennon
1996 Shovel Test Probes of Three Historic Sites on the Piñon Canyon Maneuver Site, Las Animas County, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for the Rocky Mountain Regional Office of the National Park Service for the Department of the Army, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

1999 A Cultural Resource Inventory for the U. S. Postal Service Carrier Annex in Laramie, Albany County, Wyoming. Unpublished report on file with Wyoming State Historic Preservation Office, Cheyenne, Wyoming.

2004 An Evaluation of Subsurface Soils Located in the Basement of the Victor City Hall, Teller County, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for Alliance General Contractors, LLC and the City of Victor, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

2011 Treatment and Data Recovery Plan for 5EP4826, the Southern Delivery System Project, El Paso County, Colorado (North 1B Project). Prepared for Colorado Springs Utilities and the Bureau of Reclamation, Eastern Area Office, Loveland, Colorado.

Chambellan, Collette C., Thomas J. Lennon, Steven F. Mehls, and Cara Muniz

2004 A Class III Cultural Resource Inventory of the Powers Boulevard Corridor, El Paso County, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for J.F. Sato and Associates and the CDOT, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Chambellan, Collette C., Thomas J. Lennon, Steven F. Mehls, Cara C. Muniz, Edward J. Stoner
2002 A Cultural Resource Treatment Plan for Seven Sites within the Redmond Land Exchange, Huerfano County, Colorado. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Chambellan, Collette C., Steven F. Mehls, Amie Gray, and Thomas J. Lennon
2006 Addendum to a Cultural Resource Inventory of Portions of the Proposed State Highway 402 Expansion, Larimer County, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for JF Sato and CDOT, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Chambellan, Collette C., Steven F. Mehls, and Thomas J. Lennon
2000 A Class III Cultural Resource Inventory of a Disturbed Area along Apex Road in Gilpin County, Colorado. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.
2001 A Class III Cultural Resource Inventory for the Elk Creek Lease Exploration Project Delta and Gunnison Counties, Colorado. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.
2005 Addendum to a Class III Cultural Resource Inventory of the Powers Boulevard Corridor, El Paso, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for J.F. Sato and Associates and the CDOT, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.
2011 Master Treatment and Data Recovery Plan for the Southern Delivery System Project, El Paso and Pueblo Counties, Colorado. Prepared by Western Cultural Resource Management, Inc. for Colorado Springs Utilities and the Bureau of Reclamation. Unpublished plan on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Chambellan, Collette C., Steven F. Mehls, Thomas J. Lennon, and Charles W. Wheeler
1998 Cultural Resource Inventory of the Southern Water Supply Project, Morgan Pipeline, Morgan and Weld Counties, Colorado. Unpublished report prepared for Northern Colorado Water Conservancy District. Western Cultural Resource Management, Inc., Boulder.

Downing, Barbara and Thomas J. Lennon
1979 - 1981 Initial Completeness and Technical Reviews of Cultural Resource Studies Submitted as Part of Mining Plans. Reports (2-10 pages) were submitted for the following Mines: McCurtain No. 2 - Federal Coal Mine, Oklahoma; Blue Ribbon Mine, Colorado; Ute #2 Mine, Utah; Federal Lease No. BIM-C-018820, Oklahoma; Lone Star Steel Mill Milton Mine, Oklahoma; Spring Creek Mine, Montana; North Decker Mine, Montana; Carbon No. 1 Mine, Wyoming; Black Butte Mine, Wyoming; Bokoshe Mine, Oklahoma; Falkirk mine, North Dakota; Hawks Nest East Mine, Colorado; McClure Canyon East Mine, Colorado; Rosebud East Mine, Montana; Cottonwood Portal-Wilberg Mine, Utah; Cordero Mine Wyoming; Caballo Mine, Wyoming. Prepared by Western Cultural Resource Management, Inc. for Hittman and Associates, Denver, Colorado, and submitted to the U.S. Department of the Interior, Office of Surface Mining, Denver, Colorado.

Hall, Daniel, C. Coe, J. Grady, M. Grant and Thomas J. Lennon
1980 A Cultural Resource Inventory of the Proposed Antelope Coal Mine in Converse County, Wyoming. Prepared by Western Cultural Resource Management, Inc. for NERCO,Inc., Portland, Oregon, and submitted to the Office of Surface Mining, Denver, Colorado.

Hardesty, Donald L., Steven M. Mehls, Edward J. Stoner, Thomas J. Lennon, and Richard Carrillo
1993 Hayden Hill Data Recovery Report for Lassen Gold Mining, Inc. Hayden Hill Mine Project, Lassen County, California. Prepared for Lassen Gold Mining Inc.

Hardesty, Donald L., Steven M. Mehls, Thomas J. Lennon, and Robert Peterson
1992 A Data Recovery Plan For The Historic Townsite of Riepetown, White Pine County, Nevada. Sparks, NV: WCRM for Magma Copper Company and the Bureau of Land Management.

Kearns, Timothy M., Steven F. Mehls, Charles W. Wheeler, and Thomas J. Lennon
2001 A Cultural Resource Management and Treatment Plan for the AT&T NexGen/Core Project, Arizona Portion. Western Cultural Resource Management, Inc., Report No. WCRM(F)193. Farmington, New Mexico.

Lennon, Thomas J.
1979a A Cultural Resource Inventory of Ninety Acres in Medicine Bow National Forest, Hayden Ranger District, Wyoming. Prepared by Western Cultural Resource Management, Inc. for American Selco, Salida, Colorado and submitted to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

1979b A Cultural Resource Inventory of 42 Acres in Medicine Bow National Forest, Hayden Ranger District, Wyoming. Prepared by Western Cultural Resource Management, Inc. for Union Carbide, Grand Junction, Colorado and submitted to the U.S. Department of Agriculture-Forest Service Rocky Mountain Region, Denver, Colorado.

1983 Grand Junction Conversion Transmission Line Project Environmental Assessment: Cultural Evaluation Sections. Prepared by Western Cultural Resource Management, Inc., for EDAW, Fort Collins, Colorado, and submitted to the U.S. Department of the Interior Bureau of Land Management, Grand Junction, Colorado.

1984 An Intensive Survey of Claim Exploration Pits along Keystone Gulch in Summit County, Colorado. Prepared by Western Cultural Resource Management, Inc., for the U.S. Department of Agriculture-Forest Service, Dillon, Colorado.

1989a Inventory of AMAX Exploration Proposed Drill Sites and Access Roads, Wind Mountain Project, Washoe County, Nevada. BLM CRR-2-2341 (N). Ms. copy on file, Bureau of Land Management, Winnemucca District Office.

1989b Results of Class III Survey of Proposed Wells GW-1, GW-2 and MW-1, Bodie Consolidated Mining Company, Mono County, California. Unpublished report on file, Galactic Services, Inc., Reno, Nevada, March 16, 1989.

1989c Test Core Drill Pad Clearances for the Bodie Project, Mono County, California. Unpublished report on file, Galactic Services, Inc., Reno, Nevada, March 14, 1989.

1990 Evaluation of Cultural Resources Located within the Proposed Amendment to the Wind Mountain Mine Plan of Operation, Washoe County Nevada. Unpublished report BLM CRR-2-2366 (P) on file, Bureau of Land Management, Winnemucca District Office.

Lennon, Thomas J., compiler

1984 Data Recovery Plan for Exxon's La Barge Natural Gas Project on Site 48LN1296. Thomas J. Lennon, Principal Investigator. Prepared for Exxon Company, USA, Midcontinent Division, Midland, Texas. Report submitted to U.S. Department of the Interior, Bureau of Land Management, Kemmerer Resource Area. Unpublished report on file at Western Cultural Resource Management, Inc., Boulder, Colorado.

Lennon, Thomas J., Collette Chambellan, Steve Mehls and Amie Gray

2007 Monitoring and Discovery Procedures for Lexam Explorations, Inc. Drilling at Two Well Pad Sites, Associated Access Roads and Water Line Routes, Baca National Wildlife Refuge, Saguache County, Colorado. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for Lexam Explorations, Inc. and the U.S. Fish and Wildlife Service, on file with the U.S. Fish and Wildlife Service, Lakewood, Colorado.

Lennon, Thomas J., and Steven F. Mehls

1997 A Class III Inventory of the Summit of Pike=s Peak, El Paso County, Colorado. Prepared for Clifford Taylor Architects and the City of Colorado Springs. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Lennon, Thomas J., Steven F. Mehls, and Collette C. Chambellan

1990 Cultural Resource Inventory and Evaluation of approximately Six Miles of Highway Corridor, Colorado Forest Highway 20, Routt County, Colorado. Unpublished report prepared for the Rocky Mountain Regional Office of the National Park Service, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Lennon, Thomas J., Steven M. Mehls, and Edward J. Stoner

1990 A Class III Survey and Testing Program for the Hayden Hill Project, Lassen County, California. Prepared for Nevada Gold Mining, Inc. and the Bureau of Land Management, Winnemucca District.

Lennon, Thomas J., Steven M. Mehls, Edward J. Stoner, and Mary Rusco

1990 A Data Recovery Plan for the Hayden Hill Project Lassen County, California. Prepared for Lassen Gold Company.

Lennon, Thomas J., Mary Rusco, Edward J. Stoner

1990 A Class II/III Cultural Resource Inventory of the Sleeper Mine Wetlands Enhancement Project. Volume 1, Humboldt County, Nevada. Prepared for Amax Gold Corporation.

Lennon, Thomas J., and Edward J. Stoner

1994 A Class III Cultural Resource Inventory of the Proposed Repeater Facility Site for Canyon Resources Inc., Inyo County, California. Prepared for Canyon Resources, Inc.

1994 A Class III Cultural Resource Inventory of Two Potential Clay Sources for Canyon Resources Inc., Inyo County, California. Prepared for Canyon Resources, Inc.

Lennon, Thomas J., Edward J. Stoner, and Mary Ringhoff

2010 A Data Recovery Plan for Sites CrNV-61-8850, CrNV-61-8851, CrNV-61-8866 and CrNV-61-8878, Nye County, Nevada. Prepared for Round Mountain Gold Corp. and the Bureau of Land Management, Tonopah District.

Lennon, Thomas J., Edward J. Stoner, Mary K. Rusco, and Steven F. Mehls

1998 A Plan to Perform Data Recovery at Sites CrNV-46-7679, CrNV-46-7687, CrNV-46-7691, and CrNV-46-7694 White Pine County, Nevada. Prepared for BHP Copper Company.

Lennon, Thomas J., Mark Sullivan, and Michael S. Burney

1978 A Cultural Resource Inventory of the Rocky Mountain Pre-Cambrian Project, Chaffee County, Colorado. Prepared by Western Cultural Resource Management, Inc. for American Selco, Salida, Colorado and submitted to the U.S. Department of Agriculture-Forest Service, Rocky Mountain Region, Denver, Colorado.

Lennon, Thomas J., E.K. Wade, and D.R. Sabin

1984a An Archaeological Survey of Three Timber Sales and Two Land Exchanges in the Black Hills National Forest: Item No. 3, Lost, Custer Mountain and Barrel Timber Sales and Kaubisch and Reynolds Land Exchanges. Prepared by Western Cultural Resource Management, Inc., for the U.S. Department of Agriculture-Forest Service, Lakewood, Colorado.

1984b An Archaeological Survey of Four Timber Sales in the Black Hills National Forest, South Dakota and Wyoming: Item No. 1, Dugout, Pole and Crowley Timber Sales. Prepared by Western Cultural Resource Management, for U.S. Department of Agriculture-Forest Service, Lakewood, Colorado.

1984c An Archaeological Survey of Four Timber Sales in the Black Hills National Forest, South Dakota and Wyoming: Item No. 2, Ski Slide, Paha, Rockerville and Snugget Timber Sales; Reder, Merchen, Sanders, and McClain Land Exchanges. Prepared by Western Cultural Resource Management Inc., for U.S. Department of Agriculture- Forest Service, Lakewood, Colorado.

Lennon, Thomas J., and Charles W. Wheeler

1979a An Archaeological Clearance Survey of Lateral A-11, Federal 2-1, and Federal 10-1. Prepared for Northwest Pipeline Corporation and the Bureau of Land Management, Little Snake District. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

1979b Archaeological Testing of Sites 48SH96, 48SH97 and 48SH107, Sheridan County, Wyoming. Prepared by Western Cultural Resource Management, Inc. for Sheridan Enterprises, Denver, Colorado, and submitted to the U.S. Department of the Interior, Office of Surface Mining, Denver, Colorado.

1987a A Review of Existing Cultural Resource Literature for the Craig-Bonanza 345kV Transmission Line Project. Report prepared for DOE Western Area Power Administration, Loveland, Colorado.

1987b The Craig Bonanza 345kV Transmission Line Project: Class III Cultural Resource Inventory Along a Proposed Transmission line in Moffat and Rio Blanco Counties, Colorado and Uintah County, Utah. Report prepared for the DOE-Western Area Power Administration, Loveland, Colorado.

1987c The Lake Catamount Ski Area Project: A Class III Cultural Resource Inventory and Evaluation Routt County, Colorado. Unpublished report on file at the Routt National Forest, Steamboat Springs.

Lennon, Thomas J., Charles W. Wheeler, and Steven M. Mehls
1988 The Lake Catamount Ski Area Project: A Class III Cultural Resource Inventory and Evaluation in Routt County, Colorado. Unpublished report on file at the Routt National Forest, Steamboat Springs.

Lennon, Thomas J., Charles W. Wheeler, J. Westlye, and K. Carpenter
1983 A Review and Analysis of Existing Data: Cultural and Paleontological Resources within the Public Service Company's Grand Junction Conversion Project. Prepared by Western Cultural Resource Management, Inc., for EDAW, Inc., Fort Collins, Colorado, and submitted to the U.S. Department of the Interior Bureau of Land Management, Grand Junction, Colorado.

Mehls, Steven F., Collette C. Chambellan and Thomas J. Lennon
1996 Heritage Resources Management Plan Adams Rib Recreational Area. Unpublished report prepared by Western Cultural Resource Management, Inc., prepared for the United States Forest Service, on file with the Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Mehls, Steven, F., Donald L. Hardesty, Thomas J. Lennon, and Robert Peterson
1992 A Class III Cultural Resource Inventory of the Historic Townsite of Riepetown, White Pine County, Nevada. Unpublished report BLM CRR-04-1055(P) on file, Bureau of Land Management, Ely District Office.

Mehls, Steven F., and Thomas J. Lennon
1996 Cultural Resource Class III Inventory City of Louisville, Colorado, Boulder County. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Mehls, Steven F., Thomas J. Lennon, and Collette C. Chambellan
1999 A Class III Cultural Resources Survey of the Neighbors/Redmond Property Project Area Boulder, County, Colorado. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.
2010 A Class III Cultural Resource Inventory of the Thistle Communities 1000 Rosewood Avenue Parcel, Boulder, Boulder County, Colorado. Prepared for Thistle Communities and the Bureau of Reclamation. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.
2000 A Class III Cultural Resources Survey of a Future Expansion Area at Ski Cooper. Unpublished report on file with Colorado Office of Archaeology and Historic Preservation, Denver, Colorado.

Mehls, Steven F., Edward J. Stoner, and Thomas J. Lennon
2007 A Cultural Resource Survey of 25 Drill Locations and Approximately .6 Mile of Access Road in the Pine Grove Hills for Romarco Minerals, Inc. in the Pine Grove Mineral Exploration Project Phase II Area, Lyon County, Nevada. Prepared for Romarco Minerals, Inc.

Rusco, Mary, Steven F. Mehls, Thomas J. Lennon, and Charles W. Wheeler
1988 A Class III Cultural Resource Inventory of the Willard Gold Project, Pershing County, Nevada. Unpublished report on file, Winnemucca District, Bureau of Land Management.

Shields, Wm. Lane and Thomas J. Lennon
1987 The Blue River - Gore Pass Project: A Class III Cultural Resource Inventory and Testing Program along a Proposed Transmission Line in Grand and Summit counties, Colorado. Unpublished report on file at BLM-Kremmling Resource Area Office.

Stoner, Edward J., Thomas J. Lennon, Mary Ringhoff, and Steven F. Mehls
2010 Master Treatment and Data Recovery Plan for the McGinness Hills Geothermal Project, Lander County, Nevada. Ms. on file BLM Mount Lewis Field Office, Battle Mountain, Nevada.

Stoner, Edward J., Thomas J. Lennon, and Mary Rusco
1990 A Class III Cultural Resource Inventory of the Sleeper Mine Wetlands Enhancement Project Stage II. Unpublished report on file Bureau of Land Management, Winnemucca District.

Wheeler, Charles W., and Thomas J. Lennon
1981 The Cultural Resources of Portions of Alkali Basin and Mt. Emmons, Gunnison County, Colorado. Prepared by Western Cultural Resource Management, Inc. for Camp Dresser and McKee, Denver, Colorado and submitted to the U.S. Department of Agriculture-Forest Service, Denver, Colorado.

1984a Prehistoric Evaluation for a Supplemental Environmental Impact Statement, Blue River Gore Pass Transmission Line Project, Grand County, Colorado. Prepared by Western Cultural Resource Management, Inc. for EDAW, Inc., Fort Collins, Colorado, for submission to the U.S. Department of Energy, Western Area Power Administration, Golden, Colorado.

1984b Prehistoric Resources Evaluation for a Supplemental Environmental Impact Statement, Blue River Gore Pass Transmission Line Project, Grand County, Colorado. Prepared by Western Cultural Resource Management, Inc. for EDAW, Inc., Fort Collins, Colorado, for submission to the U.S. Department of Energy Western Area Power Administration, Golden, Colorado.

1988 The Kremmling Tap-Windy Gap Substation Project: Additional Survey and Test Evaluation of Sites 5GA142, 5GA1132, 5GA1138 and 5GA1144. Unpublished report prepared for DOE-Western Area Power Administration, Loveland, Colorado.

Wheeler, Charles W., Thomas J. Lennon, and Edward J. Stoner

1990 A Class III Cultural Resource Inventory of a Well Site, Access Road, and Collection System for Tonopah Public Utilities, Nye County, Nevada. Unpublished report prepared and on file with the Tonopah Public Utilities.

Wheeler, Charles W., Thomas J. Lennon, and Robert Peterson

1988a The Ktap-Windy Gap Substation Project: Test Evaluation of Sites 5GA1166, 5GA1178, and 5GA1183. Unpublished report on file, Western Area Power Administration, Loveland, Colorado.

1988b A Cultural Resource Inventory of Well Pad Aexco Federal 12-1, 1980 FSL, 610 FWL, NW1/4 SW1/4, Section 1, T8N R58W, Weld County, Colorado.

1988c A Cultural Resource Inventory of Midwest Explorations Electric Line, Section 18, T34S R43W, Morton County, Kansas.

1988d The Kremmling Tap-Windy Gap Substation Project: Test Evaluation of Sites 5GA1166, 5GA1178, and 5GA1183. Report prepared for DOE-Western Area Power Administration, Loveland, Colorado.

Wheeler, Charles W., Thomas J. Lennon, Steven M. Mehls, Wm. Lane Shields

1987 Cultural Resource Investigations on the Black Thunder Mine, Cambell County, Wyoming. Report prepared for Thunder Basin Coal Company and submitted to USDA-Forest Service, Medicine Bow National Forest.

Wheeler, Charles, W., Thomas J. Lennon, Wm Lane Shields, and Edward J. Stoner

1987 Archaeological Data Recovery at Site 48LN529, 48LN1674 and 48LN1685. Unpublished report on file at the Bureau of Land Management, Kemmerer.

Wheeler, Charles W., Thomas J. Lennon, Wm. Lane Shields, Steven M. Mehls

1987 The Kremmling Tap - Windy Gap Substation Project: A Class III Cultural Resource Inventory Along a Proposed Transmission Line in Grand County, Colorado. Report prepared for DOE-Western Area Power Administration, Loveland, Colorado.

References:

References provided upon request.

Edward J. Stoner Jr., M.A., RPA

Lab Director and Northwest Regional Manager

Personal Information:

Address: 890 East Greg Street
Telephone: (775) 358-9003
Email: ed.stoner@wcrminc.com
Languages: English, Spanish

Academic Background/Education:

University of Nevada, Reno, **M.A. in Anthropology**, 2001
University of Colorado, Denver, **B.A. in Anthropology**, Minor in Geology; Graduate course work in Research Methods in Archaeology, Prehistoric Agriculture, and Geoarchaeology (Independent Research), 1988
Metropolitan State College, Denver, 1983

Teaching Experience:

1985-1988 Teaching and laboratory assistant: Earth Sciences Department, Metropolitan State College, Denver, Colorado. Dr. Dixon Smith, Chairman.

Museum:

1988 Cataloging of archaeological and osteological material, University of Wyoming. Karen Bridger, Supervisor.

Continuing Education:

- Theory in Contemporary Archaeology. University of Nevada, Reno, Historic Preservation Program. Patty Jo Watson, Ph.D., Instructor. January 10-13, 1994
- Introduction to Federal Projects and Historic Preservation Law. Course given by the Advisory Council on Historic Preservation. Sacramento, California. January 15-17, 1995
- Preparing Historical Contexts. University of Nevada, Reno Heritage Resources Management. Alice Baldrica, Nevada SHPO, Instructor. Reno, Nevada. March 9, 1999
- FHWA - Section 4f Workshop. Nevada Department of Transportation. Ms. Katiann Wong-Murillo and Mr. Merrill Deskins, Instructors. Carson City, Nevada. June 2, 1999
- The New 36 CFR: Highlights of Changes (New Section 106 Regulations, 1999). Presented by the Advisory Council on Historic Preservation. Alan Stanfil, Instructor. Sacramento, CA. August 4, 1999
- Access Version 2002. Business and Industry Training Center, San Juan College, Farmington, New Mexico. August 26-27, 2003
- Getting the Most from Microsoft Excel. Reno, Nevada. February 18, 2005
- Issues in Section 106: An Advanced Seminar. Dr. Thomas King, Instructor. Phoenix, Arizona. March 24-25, 2005
- The Cultural Side of NEPA. Dr. Thomas King, Instructor. Las Vegas, Nevada. April 7-9, 2006
- NEPA for Cultural Resource Managers. Dr. Thomas King, Instructor. Farmington, New Mexico. April 17-19, 2007
- Archaeological Law Enforcement. Presented by the Tribal Technical Assistance Program at Colorado State University and Archaeological Resource Investigations, Inc. Ron Hall, Martin McAllister and James Moriarty, Instructors. Acoma, New Mexico. October 9-12, 2007
- NEPA. Presented by CLE International. Reno, Nevada. March 27-28, 2008
- Archaeological Damage Assessment Class. Bureau of Land Management National Training Center and Nevada State Office. Presented by Archaeological Resource Investigations, a Division of Western Cultural Resource Management, Inc. Martin McAllister, and Dr. Charles Wheeler, Instructors. Reno, Nevada. April 28-May 2, 2008
- 24 hour HAZWOPER training and certification class. Presented by Compliance Solutions in Las Vegas, Nevada. March 14-17, 2010

- Introduction to Managing Environmental Conflict. Presented by U.S. Institute for Environmental Conflict Resolution, Reno, Nevada. December 16-17, 2010
- 40 hours of instruction and practical mediation experience required to earn a certificate in Beginning Mediation and Conflict Resolution. Training included: the mediation process, communication, culture, organizational conflict management, problem solving, and agreement writing. University of Nevada, Reno Extended Studies Program. August 4-8, 2012

Areas of Interest:

Geoarchaeology
Lithic Technology
Ground Stone Technology
Pleistocene and Holocene Ecology in the Western United States
Paleoindian and Archaic Period Traditions in the Western Intermountain Area, the Great Basin, and the Great Plains
Applications of Archaeological Method and Theory
Historical Archaeology and Historic Conservation Techniques

Membership in Professional Organizations:

Register of Professional Archaeologists
Society for American Archaeology
Society for Historical Archaeology
Nevada Archaeological Association
Society for California Archaeology

Employment:

<u>Present</u>:
Regional Manager – Project Director
Western Cultural Resource Management, Inc.
Consulting Firm, 1984 to present

Field Experience:

<u>Survey:</u>

2017	<u>Project Director.</u> Survey of 115 acres for the Robinson Nevada Mining Company Tailings Dam project in White Pine County, Nevada.
2017	<u>Project Director.</u> Survey of 192 acres for the Robinson Nevada Mining Company Keystone Dump project in White Pine County, Nevada.
2015	<u>Project Director.</u> Survey of 11 acres for the Newmont Emigrant Mine game exclosure project in White Pine County, Nevada.
2015	<u>Project Director.</u> Survey of 77 acres for the Robinson Nevada Mining County Road Realignment project in White Pine County, Nevada.
2015	<u>Project Director.</u> Survey of 33 acres for the Robinson Nevada Mining Company Adverse Claims project in White Pine County, Nevada.
2015	<u>Project Director.</u> Survey of 64 acres for the Carlin Resources Hatter Exploration project in Elko County, Nevada
2015	<u>Project Director.</u> Survey of 1307 acres for the US 395/Pyramid Highway project in Washoe County, Nevada.
2014	<u>Project Director.</u> Survey of 1035 acres for the Coeur Rochester Packard Flat project in Pershing County, Nevada.
2013	<u>Project Director.</u> Survey of 960 acres for the Robinson Nevada Copper Mine Expansion in White Pine County, Nevada.

2013	Project Director. Survey of 1,092 acres for the Robinson Nevada Copper Mine Expansion in White Pine County, Nevada.
2013	Project Director. Survey of 1,628 acres for the Newmont Twin Creek Mine Expansion project in Humboldt County, Nevada.
2012	Project Director. Survey of 8,438 acres for the Hycroft Mine Well Field project in Pershing and Humboldt Counties, Nevada.
2012	Project Director. Survey of 15,585 acres for the Hycroft Mine Expansion project in Pershing and Humboldt Counties, Nevada.
2011	Project Director. Survey of 13,684 acres for the Yerington Land Transfer Project in Lyon County, Nevada.
2011	Project Director. Survey of 4,023 acres for the Allied Nevada Gold Hasbrouck Project in Esmeralda County, Nevada.
2011	Project Director. Survey of 1,567 acres for the Allied Nevada Gold Wildcat Project in Pershing County, Nevada.
2011	Project Director. Survey of 2,825 acres for the Terra Gen Mirror Project in Churchill County, Nevada.
2011	Project Director. Survey of drill sites and roads for the Ormat Edwards Creek project in Churchill County, Nevada.
2011	Project Director. Survey of 1,506 acres for the Gradient Resources Patua Geothermal Project in Churchill and Lyon Counties, Nevada.
2011	Project Director. Survey of 1,214 acres for the Bravada Gold Wind Mountain Project in Washoe County, Nevada.
2011	Project Director. Survey of 8,359 acres for the Newmont Gold Quarry Mine Expansion Project in Eureka and Lander Counties, Nevada.
2011	Project Director. Survey of 3,239 Acres for the Ormat Dixie Valley to Jersey Valley transmission line in Churchill and Pershing Counties, Nevada.
2010	Project Director. Survey of 13.5 miles of Seismic Line for the Sierra Geothermal Alum Project in Esmeralda County, Nevada.
2010	Project Director. Survey of 1,000 Acres for the Ormat Dead Horse Project in Mineral County, Nevada.
2010	Project Director. Survey of 2,500 acres for the Ormat McGinness Hills project in Lander County, Nevada.
2010	Project Director. Survey of 480 acres for the Ormat Bannock Solar project in Lander County, Nevada.
2010	Project Director. Survey and monitoring for the Ormat Gabbs Valley project in Nye County, Nevada. Lander County, Nevada.
2010	Project Director. Survey of 800 acres for the Ann Mason mine project in Mineral County, Nevada.
2010	Project Director. Survey of 450 acres for the PMMR Mine project in Mineral County, Nevada.
2010	Project Director. Survey of the Leach Springs project of Ormat in Pershing County, Nevada.
2010	Project Director. Survey of 12 archaeological sites for mine closure in Nye County, Nevada.
2010	Project Director. Survey of 1,800 acres for the Allied Nevada Gold Wildcat project in Pershing County, Nevada.
2010	Project Director. Survey of 2,500 acres for the Allied Nevada Gold Hasbrouck project in Nye County, Nevada.
2009	Project Director. Extensive survey of seismic lines, MT lines and sites, access roads and drill sites in Mineral County, Nevada near Aurora.
2009	Project Director. Survey of 15 miles for the Fort Sage to Herlong Transmission line in Washoe County, Nevada and Lassen County, CA.
2009	Project Director. Survey of 2,000 acres for the Vulcan Power Co. Patua Project in Churchill County, Nevada.
2009	Project Director. Survey of 64 acres for AREVA Enrichment Services, LLC in Bonneville County, Idaho.
2009	Project Archaeologist. Survey of 76 Acres for the Agua Caliente, LLC Raft River Geothermal Project in Cassia County, Idaho.

2009	Project Director. Survey of 1,200 acres for the Vulcan Power Co. Salt Wells Project in Churchill County, Nevada.
2008	Project Director. Survey of 2,000 acres in Mineral County, Nevada.
2008	Project Director. Survey of 48 geothermal well locations and 27 miles of access road in Esmeralda County, Nevada.
2008	Project Director. Survey of 10 geothermal well locations in Esmeralda County, Nevada.
2008	Project Director. Survey of 28 geothermal well locations and 13 miles of access road in Lander County, Nevada.
2008	Project Director. Survey of 3,500 acres in White Pine County, Nevada.
2008	Project Director. Survey of 250 acres in Elko County, Nevada.
2008	Project Director. Survey of 42 miles of transmission line corridor and 1,800 acres in Lincoln and Clark Counties, Nevada.
2008	Project Director. Survey of 941 acres for AREVA Enrichment Services, LLC in Bonneville County, Idaho.
2008	Project Director. Survey of 26 miles of Seismic line in Esmeralda County, Nevada.
2008	Project Director. Survey of 12 Geothermal well locations in Churchill County, Nevada.
2007	Project Director. Survey of 13.3 miles of transmission line corridor in Nye County, Nevada.
2007	Project Director. Survey of 11.5 miles of transmission line corridor in Washoe County, Nevada and Lassen County, California.
2007	Project Director. Survey of 24 miles of transmission and distribution line corridor and 1,087 acres in Clark and Lincoln Counties, Nevada.
2007	Project Director. Survey of 2.5 miles of transmission line corridor in Lincoln County, Nevada.
2007	Project Director. Survey of 26 drill locations in Lyon County, Nevada.
2007	Project Director. Survey of 16.5 miles of transmission line corridor in Nye County, Nevada.
2007	Project Director. Survey of 687 acres in Nye County, Nevada.
2007	Project Director. Survey of 140 acres in Nye County, Nevada.
2007	Project Director. Survey of 240 acres in Plumas County, California.
2006	Project Director. Survey of 42.5 miles of transmission line corridor in Clark County, Nevada.
2006	Project Director. Survey of 2,440 acres in White Pine County, Nevada.
2006	Project Director. Survey of 3,311 acres in Nye County, Nevada.
2003	Project Director. Survey of 115 acres in Nye County, Nevada.
2003	Project Director. Survey of 500 acres in Pershing County, Nevada.
2000	Project Director. Survey of 1880 acres near Wendover in Elko County, Nevada.
2000	Project Director. Survey of 440 acres near Carson City in Douglas County, Nevada.
2000	Project Director. Survey, recordation and evaluation of the Riley Mine in Humboldt County, Nevada.
1999	Project Director. Survey of 900 acres near Wendover in Elko County, Nevada.
1999	Project Director. Survey of 150 acres near Reno in Washoe County, Nevada.
1999	Project Director. Survey of 3200 acres in Humboldt County, Nevada.
1999	Project Director. Survey of 320 acres in Humboldt County, Nevada.
1999	Project Director. Survey of 640 acres in Humboldt County, Nevada.
1999	Project Director. Survey of 10 miles of natural gas pipeline in Storey, Lyon, and Douglas Counties, Nevada.
1997	Project Director. Survey of 370 acres near Ruth in White Pine County, Nevada.
1997	Project Director. Survey of 1600 acres in the Dry Hills in Humboldt County, Nevada.
1997	Project Director. Survey of 2500 acres near Tuscarora in Elko County, Nevada
1997	Project Director. Survey of 1,400 acres in Washoe Valley, Washoe County, Nevada.
1997	Project Director. Survey of 3,400 acres near Midas in Elko County, Nevada.
1997	Project Director. Survey of 22 acres in Sun Valley, Washoe County, Nevada.
1996	Project Director. Survey of 228 acres in Washoe County, Nevada.
1996	Project Director. Survey of 6 spring/seep sites in Jacks Valley, Douglas County, Nevada.
1996	Project Director. Survey of 89 acres near Mt. Rose in Washoe County, Nevada.
1996	Project Director. Survey of 8,353 acres in Elko County, Nevada.
1996	Project Director. Survey of 750 acres in Inyo County, California.

1995	Project Director. Revisit and evaluation of 6 previously recorded sites in Inyo County, California.
1995	Project Director. Archaeological reconnaissance of approximately 440 acres in Washoe County, Nevada.
1995	Project Director. Survey of approximately 10,000 acres in Huerfano County, Colorado.
1995	Field Supervisor. Survey and recordation of Briggs Discovery Site #1, Inyo County, California.
1993	Field Supervisor. Survey of 840 acres in Inyo County, California.
1993	Field Supervisor. Geomorphological assessment of site 26CH1040 Churchill County, Nevada.
1993	Field Supervisor. Survey of 140 acres in Nye County, Nevada.
1993	Field Supervisor. Survey of 300 acres near Round Mountain, Nye County, Nevada.
1993	Field Supervisor. Survey of several miles of access road, transmission line R.O.W., pipeline corridors, and recordation of 70 sites in White Pine County, Nevada.
1993	Field Supervisor. Survey of 16.5 acres in White Pine County, Nevada.
1993	Field Supervisor. Survey of 3 miles of access road and a drill pad site in Nye County, Nevada.
1993	Field Supervisor. Survey of 1,000 acres in White Pine County, Nevada.
1993	Field Supervisor. Survey and recordation of the historic townsite Riepetown, White Pine County, Nevada. Responsible for coordinating EDM mapping and recordation of approx. 500 features.
1993	Field Supervisor. Survey of 1 mile of access road and 1.5 acre drill pad site in White Pine County, Nevada.
1993	Field Supervisor. Survey of 200 acres in Washoe County, Nevada
1991	Field Supervisor. Monitor of drill road construction, Eureka County, Nevada.
1991	Field Supervisor. Recordation of a National Register Eligible Quarry, 26WP46-30, White Pine County, Nevada.
1991	Field Supervisor. Survey of 1.5 miles of access road in Pershing County, Nevada.
1991	Field Supervisor. Survey of 1 mile of access road in Humboldt County, Nevada.
1990	Field Supervisor. Survey of 6 drill hole sites in Lassen County, California.
1990	Field Supervisor. Survey of 15 drill hole sites in Washoe County, Nevada.
1990	Field Supervisor. Survey of 875 acres and 1.5 miles of access road corridor in Malheur County, Oregon.
1990	Field Supervisor. Recordation and EDM mapping of site P-32 Mono County, California. Duties included assessment of site geomorphology in order to facilitate recommendations for subsurface testing program.
1990	Field Supervisor. Survey of 2500 acres in Humboldt County, Nevada.
1990	Field Supervisor. Survey of 16 miles of access road in Malheur County, Oregon.
1990	Field Supervisor. Survey of 163 acres in Malheur County, Oregon.
1990	Field Supervisor. Survey of 430 acres and 5 miles of road in Malheur County, Oregon.
1990	Field Supervisor. Survey of 4.5 miles of road in Lassen County, California.
1990	Field Supervisor. Survey of 480 acres in Pershing County, Nevada.
1990	Field Supervisor. Survey of 5.5 miles of access road in Elko County, Nevada associated with the Tosawihi Quarries National Register District.
1989	Field Supervisor. Survey of 4600 acres in Humboldt County, Nevada.
1989	Field Supervisor. Survey of the Historic Bodie Mining District, Mono County, California. Included mapping with a total station EDM.
1989	Field Supervisor. Survey of the Battle Lake Road Corridor Carbon County, Wyoming.
1989	Field Supervisor. Survey of 500 acres adjacent to the Lowry Landfill, Arapahoe County, Colorado.
1989	Field Supervisor. Survey of 3800 acres including the Hayden Hill townsite, Lassen County, California.
1989	Field Supervisor. Survey of 1500 acres in Malheur County, Oregon.
1988-1989	Field Supervisor. Survey of a large prehistoric lithic quarry site in Washoe County, Nevada. Field Supervisor in charge of crew coordination for a complex data recovery program.
1988	Crew Chief. Land exchange survey in Morgan County, Colorado.
1988	Supervisor. Project archaeologist on airport runway survey in Arapahoe County, Colorado.
1987	Crew Chief. Power transmission line right-of-way survey in Grand County, Colorado.
1987	Crew Chief. Large ski area survey in Routt County, Colorado.

1986 Crew Member. Power transmission line right-of-way survey in Grand County, Colorado. Duties included assessment of project area geology and geomorphology.

1984 Crew Member. Survey of a small portion of the Exxon Shute Creek Project, Lincoln County, Wyoming.

Excavation

2016 Project Director in direct charge of 26 archaeologists. Excavation of 155 sites in Elko County, Nevada.

2015 Project Director in direct charge of 5 archaeologists. Excavation of one site in Pershing County, Nevada.

2015 Project Director in direct charge of 28 archaeologists. Excavation of 87 sites in Elko County, Nevada.

2013 Project Director in direct charge of 18 archaeologists. Excavation of eight sites in Humboldt County, Nevada.

2012 Project Director in direct charge of 28 archaeologists. Excavation and data recovery of 35 sites in Pershing and Humboldt Counties, Nevada.

2011 Project Director in direct charge of 21 archaeologists. Excavation and data recovery of 17 sites/loci of the McGinness Hills National Register Eligible Archaeological District in Lander County, Nevada.

2011 Project Director in direct charge of 21 archaeologists. Excavation and data recovery of Locus A/R of the Fire Creek National Register Eligible Archaeological District in Lander County, Nevada.

2011 Project Director in direct charge of 8 archaeologists. Excavation and data recovery of five sites near Round Mountain, Nye County, Nevada.

2010 Project Director in direct charge of 21 archaeologists. Excavation and data recovery on eight loci of the Fire Creek National Register Eligible Archaeological District in Lander County, Nevada.

2010 Project Director in direct charge of 10 archaeologists. Excavation of the Fort Whipple Military Hospital land fill in Yavapai County, Arizona.

2010 Project Director in direct charge of 7 archaeologists. Excavation of a historic homestead in Bonneville County, Idaho.

2008 Project Manager in direct charge of 15 archaeologists. Excavation and data recovery on site 26WP7689 in White Pine County, Nevada.

2007 Project Manager in direct charge of 5 archaeologists. Excavation and data recovery on sites CrNV-46-7348, -7354, and -7602/26WP7665 in White Pine County, Nevada.

2006 Project Manager in direct charge of 9 archaeologists. Excavation and data recovery on sites 26WP7420 and 26WP7458 in White Pine County, Nevada.

2006 Project Manager in direct charge of 12 archaeologists. Excavation of site 26WP2353 in White Pine County, Nevada.

2005 Project Manager in direct charge of 9 archaeologists. Excavation of sites 26WP2353 and 26WP2418 in White Pine County, Nevada.

2004 Project Manager in direct charge of 15 archaeologists. Excavation of site 26Wa7255 (Discovery 68), a multi-component stratified prehistoric village site on a terrace of the Truckee River in Reno, Nevada.

2003 Project Manager in direct charge of 6 archaeologists. Excavation of the Harlem Club (Discovery 33) for the ReTRAC project in Washoe County, Nevada.

2003 Project Manager in direct charge of 15 archaeologists. Excavation of the Frank Brothers Bottling Works (Discovery 17) for the ReTRAC project in Washoe County, Nevada.

2003 Project Manager in direct charge of 8 archaeologists. Excavation of CrNV-11-3254 (the Sheepwater Site), a Middle and Late Archaic site in Elko County, Nevada.

2003 Project Manager in direct charge of 2 archaeologists. Excavation of Discovery 7 for the ReTRAC project in Washoe County, Nevada.

2002 Project Manager in direct charge of 45 archaeologists. Excavation of 34 sites in Hudspeth, Culberson, Gaines, and El Paso Counties, Texas.

2001 Crew Chief. Excavation of site LA58412, Luna County, New Mexico.

2001 Project Manager. Excavation of site 26Wa6915 (Center Street Cistern, Reno, Nevada).

2001	Project Manager. Test excavation of site CrNV-03-5505, a dugout and historic bottle cache in Alpine County, California.
2001	Project Manager. Non-site testing of the Reno Railroad Corridor.
1999	Project Manager. Evaluative testing of 4 sites in Washoe County.
1998	Project Director in direct charge of 13 archaeologists. Mitigative excavations and data collection on 13 sites in White Pine County, Nevada.
1997	Project Director in direct charge of 15 archaeologists. Mitigative excavations and data collection on 22 sites in White Pine County, Nevada.
1997	Project Director. Mitigative excavation and data collection on Site CrNV-03-4998 Washoe County, Nevada.
1997	Project Director. ARPA testing of Site CrNV-03-4998 Washoe County, Nevada.
1995	Project Director. Mitigative excavation of Site 26D0439 Douglas County, Nevada. In direct charge of 15 archaeologists conducting a large scale excavation (250 square meters) of a stratified, multicomponent prehistoric winter village site on the Carson River.
1995	Project Director. Mitigative excavation of Site CrNV-46-7407, a Late Archaic campsite in White Pine County, Nevada.
1994	Project Director. Test excavations at Site 26Do439 Douglas County, Nevada.
1994	Project Director. Mitigative excavation of Site CrNV-46-7404 White Pine County, Nevada.
1994	Project Director. Significance testing and assessment of geomorphology of site 5TL464 Teller County, Colorado.
1993	Project Director. Mitigative excavation and data recovery of sites 26WP2412 and 26WP2874 (Old Giroux Wash Sites), White Pine County, Nevada. In direct charge of 10 to 15 archaeologists excavating, mapping, and collecting at two upland Pre-Archaic sites.
1993	Field Supervisor. Test excavation of a rockshelter (CrNV-61-7428) in Nye County, Nevada.
1993	Field Supervisor. Subsurface evaluation using shovel test probes and backhoe trenching of 20 newly recorded sites and 16 previously recorded sites in White Pine County, Nevada.
1992-1993	Project Director. Mitigative excavation of the Riepetown site in White Pine County, Nevada. In direct charge of 15-22 archaeologists excavating and evaluating a late 19th, early 20th century townsite. A total of 62 Features ranging in size from large building vestiges to privy pits were excavated.
1992	Field Supervisor. Test excavation of CrNV-61-0360, Feature 6-1431-G1 at Round Mountain, Nevada.
1991	Field Supervisor. Test excavation of a rock shelter (CRNV-31-4335) in Lyon County, Nevada.
1991	Field Supervisor and Lab Director. Mitigative excavation of the Hayden Hill Townsite, Lassen County, California. In direct charge of 15-20 archaeologists excavating and evaluating a late 19th, early 20th century gold mining town. Excavations ranged in size from 2 sq.m to 15 sq.m.
1990	Field Supervisor. Significance testing of 1 site and assessment of geomorphology at 4 sites in Lassen County, California.
1990	Field Supervisor. Significance testing and assessment of geomorphology of 7 sites in Malheur County, Oregon.
1990	Field Supervisor. Test excavation of an Archaic spring site in Malheur County, Oregon.
1990	Field Supervisor. Administration of a significance testing program at Pre-Archaic and Archaic sites in Malheur County, Oregon.
1989	Field Supervisor. Administration of an extensive significance testing program in an area of the former townsite of Hayden Hill, Lassen County, California.
1989	Field Supervisor. Geomorphological testing of 2 prehistoric sites in Lassen County, California to determine the integrity of a buried component in a potentially disturbed context.
1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26Wa3691, Washoe County, Nevada.
1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26Wa3687, Washoe County, Nevada.
1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26Wa3689, Washoe County, Nevada.

1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26Wa3688, Washoe County, Nevada.
1989	Field Supervisor. Test excavation of several features at the historic Battle Townsite, 48CR1209, Carbon County, Wyoming.
1989	Project Manager. Mitigative excavation of the Copperton Townsite, 48CR1210, Carbon County, Wyoming. In direct charge 20 archaeologists excavating a turn-of-the century copper mining supply center. Excavations ranged from 2 sq.m to 280 sq.m.
1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26WA3808, Washoe County, Nevada.
1989	Field Supervisor. Mitigative excavation of a multicomponent rock shelter, 26WA3803, Washoe County, Nevada.
1989	Field Supervisor. Test excavation of 7 rock shelters in the Lake Range Quarries National Register District, Washoe County, Nevada.
1988	Crew Chief. Test excavation of 5RT650, Routt County, Colorado. Duties included field analysis of soils and assessment of site geomorphology.
1988	Crew Chief. Test excavation of the Copperton Townsite 48CR1210, Carbon County, Wyoming. Included supervision of shovel testing program, analysis and curation of historic artifacts.
1987	Crew Chief. Test excavation of three sites in Grand County, Colorado.
1987	Crew Chief. Mitigative excavation of a multi-component stratified sand dune site (48LN529) in Lincoln County, Wyoming.
1986	Crew Member. Test excavation of several sites in Grand County, Colorado.
1984-1985	Crew Member. Mitigative excavation of several stratified sand dune sites in Lincoln County, Wyoming. Excavations ranged from 2 sq.m to 400 sq.m per site.
1976	Crew Member. Excavation at the Wallace Ruin, Cortez, Colorado.

Laboratory:

2015-2016	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of materials from 165 sites in Elko County, Nevada.
2013-2014	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of materials from 35 sites in Humboldt and Pershing Counties, Nevada.
2011-2012	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of materials from the Fire Creek National Register Archaeological District; materials for the McGinness Hills National Register Archaeological District; materials from five sites near Ruth, Nevada; and materials from 35 sites in Humboldt and Pershing Counties, Nevada.
2009-2010	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of materials from the Fire Creek National Register Archaeological District; a homestead site in Idaho; and materials from the Fort Whipple Hospital land fill in Prescott, Arizona.
1998-2008	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of materials from 37 historic sites and 2 prehistoric sites on the ReTRAC project in Reno, Nevada, from a Late Archaic site in Washoe County, Nevada, and from 22 prehistoric sites in White Pine County, Nevada. Field lab director for 34 sites near El Paso, Texas; data base management, report writing, and arrangement of outside laboratory analyses.
1995-1997	Laboratory Director for all WCRM, Inc. Nevada projects. Duties include direct supervision of analysis of material from a Late Archaic site in White Pine County, Nevada, an historic period site in White Pine County, Nevada, and an Archaic winter village site in Douglas County, Nevada, data base management, report writing, and arrangement of outside laboratory analyses. Other duties include management of quality control and assurance for the multi-site Cripple Creek mitigation project.
1994	Laboratory Director for WCRM, Inc. Duties include direct supervision of analysis of material from two upland Pre-Archaic sites in White Pine County, Nevada, data base management, report writing, and arrangement of outside laboratory analyses including pollen, petrographic, obsidian sourcing, blood protein residue, radiocarbon, and soil studies. Additional duties included the establishment of a field laboratory for a multi-site mitigation project in Victor, Colorado.

1993 Laboratory Director for WCRM, Inc. Duties included direct supervision of analysis of material from the Riepetown townsite excavation, data base management, report writing, and arrangement of outside laboratory analyses including macrobotanical, faunal, and soil studies.

1992 Laboratory Director for WCRM, Inc. Duties included direct supervision of analysis of material from two historic excavations, data base management, report writing, research, and arrangement of outside laboratory analyses including pollen, macrobotanical, and soil studies. Also in direct charge of analysis of prehistoric artifacts from the above mentioned projects and in curation of material from the Lake Range Quarry National Register District.

1991 Field Laboratory director. Included setup and administration of field conservation laboratory for the Hayden Hill townsite excavation, Lassen County, California. Thomas J. Lennon, Principal Investigator.

1991 Laboratory Director for WCRM, Inc. Duties included supervision of lithic analysis, report writing, research, and arrangement of outside laboratory studies including, geochemical studies (ICP), obsidian sourcing and hydration, pollen, flotation, soils (textural and chemical), petrology, and protein residue analysis.

1989-1990 Laboratory Director for WCRM, Inc. Duties included setup of Reno Nevada office and lab, database design for several large projects, analysis of lithic artifacts from the Lake Range Quarries National Register District, Washoe County, Nevada and curation. Other duties include co-authorship of Lake Range report, and the methodology section of the Copperton historic townsite report.

1989 Project Manager/Lab Director. Included setup and administration of field conservation laboratory for the Copperton townsite excavation, Carbon County, Wyoming. Thomas J. Lennon, Principal Investigator.

1989 Lab Director. Responsibilities included field lab setup, check-in and analysis of lithic material form the Lake Range Quarries National Register District, Washoe County, Nevada. Thomas J. Lennon, Principal Investigator.

1988 Curation of lithic material from Shute Creek, Lincoln County, Wyoming. Thomas J. Lennon, Principal Investigator.

1988 Analysis of lithic material from the Smithsonian River Basin Surveys ca. 1949, Sulley County, South Dakota. Rick Carasco, Principal Investigator.

1987 Analysis of historic artifacts from the Copperton townsite, Carbon County, Wyoming. Lab Supervisor. Thomas J. Lennon, Principal Investigator.

1987 Analysis of lithic material from several sites in Campbell County, Wyoming. Lab Supervisor. Thomas J. Lennon, Principal Investigator.

1987 Analysis of lithic material from a stratified sand dune site in Lincoln County, Wyoming. Lab Supervisor. Thomas J. Lennon, Principal Investigator.

1985-1986 General archaeological laboratory assistant. Duties included artifact check-in, counting, cleaning, curation, and debitage analysis. Thomas J. Lennon and Charles W. Wheeler, Principal Investigators.

Reports:

Cunnar, Geoffrey, Edward J. Stoner, Charles W. Wheeler, and Rocky Brockway
2017 *Treatment and Data Recovery of 151 Sites at the Long Canyon Mine, Elko County, Nevada.* Ms. on file at the BLM Elko Field Office.

Stoner, Edward J., and Geoffrey Cunnar
2016 *A Historic Properties Treatment Plan and an Unevaluated Sites Testing Plan for Sites in the Yerington Lands Conveyance APE, Lyon County, Nevada.* Ms. on file at the Nevada State Historic Preservation Office, Carson City, Nevada.

Stoner, Edward J., Perry Lown, and Steven F. Mehls
2016 *A Class III Cultural Resources Inventory of 1,035 Acres for Coeur Rochester, Inc. in Packard Flat, Pershing County, Nevada*. Ms. on file at the BLM Winnemucca, Nevada field office.

Cunnar, Geoffrey, Edward J. Stoner, Steven F. Mehls, and Tara Cannon

2015 26WP7689: Data Recovery at a Multicomponent Site in the Egan Range, White Pine County, Nevada. Ms. on file at the BLM Ely Field Office.

Cunnar, Geoffrey, Edward J. Stoner and Charles W. Wheeler

2015 *The Archaeology of the Fire Creek National Register Archaeological District, Lander County, Nevada: Data Recovery at Loci AR, S, V, Y, AJ, AG, and AC*. Ms. on file at the BLM Battle Mountain, Nevada field office.

Lechner, Theresa, Jackson Mueller, and Edward J. Stoner

2015 *A Class III Cultural Resource Inventory of 16,846 Acres for the Allied Nevada Gold Corporation's Hycroft Mine Expansion Project in Humboldt and Pershing Counties, Nevada*. Ms. on file at the BLM Winnemucca, Nevada field office.

Mueller, Jackson C., Geoffrey Cunnar, Edward Stoner, and Steven Mehls

2015 *Treatment and Data Recovery of Sites 26Wp7364, 26Wp7450, 26Wp7459, 26Wp7666, 26Wp7697, and 26Wp7700, White Pine County, Nevada*. Ms. on file BLM, Ely, Nevada.

Stoner, Edward J. and Teresa A. Wriston

2015 *A Treatment and Data Recovery Plan for the Coeur Rochester, Inc. Plan of Operations Area Number 10 Area of Potential Effects, Pershing County, Nevada*. Ms. on file at the BLM Winnemucca, Nevada field office.

2015 *A Class III Cultural Resources Inventory for the Pyramid Highway/US 395 Connection Project in Washoe County, Nevada*. Ms. on file at the BLM Carson City, Nevada field office.

Stoner, Edward J., Mary Ringhoff, Renee Kolvet, and Jaclyn Raley

2015 *A Class III Cultural Resources Inventory for the Yerington Land Conveyance and Sustainable Development Act in Lyon and Mineral Counties, Nevada.* Ms. on file at the BLM Carson City, Nevada field office.

Stoner, Edward J.

2012 Painted Stone, Broken Stone: Worldview and Site Formation Processes at the Daylight Site (26Wa7522), Washoe County, Nevada. In *No Stone Unturned: Recent Trends in Ground Stone Studies in the Great Basin and Beyond*, edited by Renee Corona Kolvet and Meredith (Penny) Rucks. Pp. 65-81. *Nevada State Museum Anthropological Papers* No. 30, Carson City.

2012 *Treatment and Data Recovery Recommendations for Six Sites Within the Robinson Operations Area, White Pine County, Nevada*. Ms. on file BLM, Ely, Nevada.

Stoner, Edward J., Charles Wheeler, Steven Mehls, Tara Cannon, Mark Estes, and Ginny Bengston

2012 *A Treatment and Data Recovery Plan for 34 Sites in the Hycroft Mine Expansion Project, Humboldt and Pershing Counties, Nevada*. Ms. On file at the BLM Winnemucca, Nevada field office.

Mary C. Ringhoff and Edward J. Stoner

2012 *The River and Railroad: An Archaeological History of Reno.* University of Nevada Press, Reno.

Mehls, Steven F., Stephen W. Yost, and Edward J. Stoner

2011 *Archaeological Data Recovery at 10BV246: The John Leopard Homestead, Bonneville County, Idaho.* Prepared for AREVA Enrichment Services, LLC.

Stoner, Edward J.

2011 Digging Smarter: CRM and Buried Open Sites in the Great Basin in, *Archaeology in 3D: Deciphering Buried Sites in the Western U.S.,* edited by Heidi Roberts and Matthew Sedon. Pp. 71-84. SAA Press, Washington, D.C.

Stoner, Edward J., Thomas J. Lennon, Mary Ringhoff and Steven F. Mehls

2010 *Master Treatment and Data Recovery Plan for the McGinness Hills Geothermal Project, Lander County, Nevada.* Ms. on file BLM Mount Lewis Field Office, Battle Mountain, Nevada.

Ringhoff, Mary C., and Edward J. Stoner

2010 *A Treatment Plan for Historic Site MW004 in the Area of the Proposed Eagle Rock Enrichment Facility, Bonneville County, Idaho.* Prepared for AREVA Enrichment Services, LLC.

Stoner, Edward J.

2009 *A Class III Cultural Resource Inventory of Six Drill Pad Locations and Approximately 0.9 Miles of Access Road in the Raft River Valley, Cassia County, Idaho.* Prepared for EMPS, Inc.

2009 *Letter Report on the Geochemical Analysis of Obsidian Artifacts from Bonneville County, Idaho.* Submitted to Dr. Kenneth Reid, Idaho State Historical Society.

2009 *Archaeological Monitoring and Discovery Plan for the Eagle Rock Enrichment Facility, AREVA Enrichment Services, LLC, in Bonneville County, Idaho.*

Stoner, Edward J.
2008 *A Data Recovery Plan for Contributing Elements to the Fire Creek National Register Archaeological District in Lander County, Nevada*. Ms. on file at the BLM Battle Mountain, Nevada field office.

Stoner, Edward J, Mary C. Ringhoff and Jennifer Sigler
2008 *An Archaeological Inventory of Approximately 24 Miles and 1,207 Acres in Related Pull Sites, Substations, and Facilities for the Coyote Springs 138 kV Transmission Line Project, Lincoln County and Clark County, Nevada.* Prepared for Electrical Consultants, Inc.

Stoner, Edward J., Jennifer Sigler, Mary C. Ringhoff, and Jaclyn Raley
2008 *A Cultural Resource Inventory of Approximately 12.3 Miles of Transmission Line for the Plumas-Sierra Fort Sage to Herlong 120 kV Interconnection Project in Lassen County, California and Washoe County, Nevada.* Prepared for Plumas-Sierra Rural Electric Cooperative.

Stoner, Edward J., Robert R. Peterson, and Mary Ringhoff
2008 *A Cultural Resource Inventory of the Plumas Sierra Wind Farm Project in Plumas County, California*. Prepared for Plumas-Sierra Rural Electric Cooperative.

Sigler, Jennifer, and Edward J. Stoner
2008 *An Intensive Cultural Resource Inventory of 315 Acres of Private Land and One Mile of Access Road for the Sugarloaf Ranch Development in Plumas County, California*. Prepared for K. Krater Consulting.

Ringhoff, Mary C., Edward J. Stoner, Collette C. Chambellan, and Steve Mehls
2008 *A Class III Cultural Resource Inventory of the Proposed Eagle Rock Enrichment Facility, Bonneville County, Idaho*. Prepared for AREVA Enrichment Services LLC.

Stoner, Edward J., Amie Gray, and Mary Ringhoff
2007 *A Class III Cultural Resource Inventory of 3,133 Acres for the Round Mountain Gold Corporation Mine Expansion Project in Nye County, Nevada*. Prepared for Round Mountain Gold Corporation.

Mehls, Steven F., Edward J. Stoner, and Thomas J. Lennon
2007 *A Cultural Resource Survey of 25 Drill Locations and Approximately .6 Mile of Access Road in the Pine Grove hills for Romarco Minerals, Inc. in the Pine Grove Mineral Exploration Project Phase II Area, Lyon County, Nevada*. Prepared for Romarco Minerals, Inc.

Sigler, Jennifer, Steve F. Mehls, Edward J. Stoner, and Amie Gray
2007 *A Class III Inventory of Approximately 189 Acres for the Round Mountain Gold Corporation Salisbury Peak Project in Nye County, Nevada*. Prepared for Round Mountain Gold Corporation.

Stoner, Edward J., Mary C. Ringhoff, and Amie Gray
2007 *Archaeological Inventory of Portions of Ten Sections for the Robinson Nevada Mining Company Ruth Pit Expansion Project, White Pine County, Nevada*. Prepared for Robinson Nevada Mining Company.

Stoner, Edward J., and Mary C. Ringhoff
2007 *Archaeological Inventory of Approximately 16.7 Miles and 460 Acres in Related Pull Sites, Substations, and Facilities for the Johnnie Substation to Stirling Mountain Substation 230 kV Transmission Line Project in Nye County, Nevada.* Prepared for Electrical Consultants, Inc.

Stoner, Edward J., Mary C. Ringhoff, and Steven F. Mehls
2006 *Master Treatment and Data Recovery Plan for the Robinson Operations Area, White Pine County, Nevada.* Prepared for Robinson Nevada Mining Company.

Stoner, Edward J., and Mary C. Ringhoff
2006 *Historical Context for the Robinson Mining District, White Pine County, Nevada*. Prepared for Robinson Nevada Mining Company.

2006a *An Archaeological Inventory of Portions of Seven Sections for the Robinson Nevada Mining Company Tripp Veteran Pit Expansion Project, White Pine County, Nevada*. Prepared for Robinson Nevada Mining Company.

Stoner, Edward J., Mary C. Ringhoff, Robert R. Peterson, and Jennifer Sigler
2006 *The Archaeology of "The Biggest Little City in the World." The ReTRAC Project, Reno, Washoe County, Nevada: Prehistoric Resources*. Prepared for the City of Reno, Nevada.

Ringhoff, Mary C., Robert R. Peterson, Steven F. Mehls, Robert Leavitt, Jennifer Sigler, and Edward J. Stoner
2006 *The Archaeology of "The Biggest Little City in the World." The ReTRAC Project, Reno, Washoe County, Nevada: Historic Resources*. Prepared for the City of Reno, Nevada.

Stoner, Edward J., and Steven F. Mehls
2003 *A Treatment Plan for Contributing Elements to Three Sites Determined Eligible to the National Register of Historic Places Located Within the Proposed Gold Hill National Register District, Nye County, Nevada*. Prepared for Round Mountain Gold Corporation.
Peterson, Robert R., Mary Ringhoff, Jennifer Sigler, and Edward J. Stoner
2003 *A Class III Cultural Resource Inventory of Three Parcels near Goldfield, Esmeralda County, Nevada*. Prepared for Metallic Ventures (U.S.), Inc.
Peterson, Robert R., and Edward J. Stoner
2003 *A Class III Cultural Resource Inventory for the Kiley Ranch Project, Spanish Springs Valley, Washoe County, Nevada*. Prepared for Ryten Properties, LLC.
Peterson, Robert R., Edward J. Stoner, Mary Ringhoff, and Steven F. Mehls
2003 *An Addendum to the Archaeology of the Gold Hill Project, Nye County, Nevada*. Prepared for Round Mountain Gold Corporation.
Peterson, Robert R., and Edward J. Stoner
2003 *A Class III Cultural Resource Inventory for the Standard Mine, Section 1 Exploration Area, Pershing County, Nevada*. Prepared for Florida Canyon Mining Company.
Peterson, Robert R., and Edward J. Stoner
2003 *A Class III Cultural Resource Inventory for the Pilot Peak Mine Section 10 Areas, Elko County, Nevada*. Prepared for Graymont U.S., Inc.
Ringhoff, Mary C., and Edward J. Stoner
2003 *An Archaeological Inventory of 89 Drill Sites and Approximately 5 Miles of Proposed Access Road for Metallic Ventures (U.S.) Inc., in Mineral County, Nevada*. Prepared for Metallic Ventures (U.S.), Inc.
Ringhoff, Mary C., and Edward J. Stoner
2003 *A Class III Cultural Resource Inventory of Approximately 1280 Acres for the Getchell Gold Mine, Humboldt County, Nevada*. Prepared for Placer Dome U.S., Getchell Gold Mine.
Stoner, Edward J., and Mary K Rusco
2001 *A pá wa detdé' yi' Village: The Archaeology of the Sunridge Site (26Do439) Douglas County, Nevada*. Prepared for the Environmental Protection Agency and Las Vegas Paving Corporation.
Stoner, Edward J., Thomas F. Langheim, Steven F. Mehls, and Leif J. Christian
2001 *An Archaeological Inventory of the Gold Hill Project, Nye County, Nevada.* Prepared for Round Mountain Gold Corporation.
Thomas F. Langheim, Edward J. Stoner, and Steven F. Mehls
2001 *Class III Cultural Resource Inventory for the Indian Creek Recreation Area Fuels Management Project, Alpine County, California.* Prepared for the Bureau of Land Management Carson City Field Office, Carson City, Nevada.
Stoner, Edward J.
2001 *Quarriers, Arrow Makers, and Hunters of the Egan Range: A Case for Integrated Toolstone Procurement, Stone Tool Production, and Subsistence*. Unpublished Master's Thesis, University of Nevada, Reno.
Stoner, Edward J.
2001 *An Archaeological Inventory of 20 Acres and Two Proposed Drill Sites for Metallic Venture's Esmeralda Project, Mineral County, Nevada.* Prepared for Metallic Ventures (U.S.), Inc.
Stoner, Edward J., Mary K. Rusco, and Leif Christian
2000 *Prehistoric Toolstone Quarriers of the Southern Ruby Range: Data Recovery at Sites Within the Horseshoe/Galaxy Project, White Pine County, Nevada*. Prepared for Placer Dome U.S., Bald Mountain Mine.
Stoner, Edward J., Mary K. Rusco, and Charles W. Wheeler
2000 *Toolstone Quarriers and Stone Tool Carriers: The Archaeology of Nine Sites in the Egan Range, White Pine County, Nevada*. Prepared for BHP Copper.
Stoner, Edward J., Mary K. Rusco, and Charles W. Wheeler
2000 *The Archaeology of Two Upland Paleoarchaic Sites in Giroux Wash, White Pine County, Nevada*. Prepared for BHP Copper.
Stoner, Edward J., Mary K. Rusco, and Charles W. Wheeler
1999 *The Archaeology of the Rosegate Site (26WP4629), White Pine County, Nevada*. Prepared for BHP Copper.

Stoner, Edward J., Mary K. Rusco, and Thomas F. Langheim
1999 *A Report on Data Recovery at Site CrNV-03-4998, Washoe County, Nevada.* Prepared for the Pyramid Lake Paiute Tribe.
Stoner, Edward J., and Steven F. Mehls
1999 *A Treatment Report for Sites 26WP2966 and 26WP2967, White Pine County, Nevada*. Prepared for BHP Copper.
A Treatment Report for Site 26WP2964, White Pine County, Nevada. Prepared for BHP Copper.
Stoner, Edward J. and Leif Christian
1999 *An Archaeological Overview and Inventory of Portions of the Paiute Pipeline Carson Lateral Loop in Storey, Lyon, and Douglas Counties, Nevada*. Prepared for EIS Consulting, Inc.
Stoner, Edward J. and Leif Christian
1999 *A Class III Cultural Resource Inventory of 550 Acres for the Cortez Gold Mines, Lander County, Nevada.* Prepared for Placer Dome US, Cortez Gold Mines.
Stoner, Edward J. and Leif Christian
1999 *A Class III Cultural Resource Inventory of Approximately 3200 Acres for the Getchell Gold Mine, Humboldt County, Nevada*. Prepared for Placer Dome US, Getchell Gold Mine.
Stoner, Edward J. and Leif Christian
1999 *A Class III Cultural Resource Inventory of Approximately 320 Acres in Section 32 Near the Getchell Gold Mine, Humboldt County, Nevada.* Prepared for Placer Dome US, Getchell Gold Mine.
Stoner, Edward J. and Leif Christian
1999 *A Class III Cultural Resource Inventory of Section 5 Near the Getchell Gold Mine, Humboldt County, Nevada*. Prepared for Placer Dome US, Getchell Gold Mine.
Stoner, Edward J., Steven F. Mehls, and Thomas F. Langheim
1999 *Baseline Cultural Resource Inventory for the US 395/Clear Acre Lane Environmental Assessment*. Prepared for Ch2MHill.
Baseline Cultural Resource Inventory for the US 395/Meadowood Environmental Assessment. Prepared for Ch2MHill.
Stoner, Edward J., and Thomas F. Langheim
1999 *An Archaeological Inventory for the Round Mountain Gold Mineral Exploration Project in Dry Canyon, Nye County, Nevada*. Prepared for Round Mountain Gold Corp.
Stoner, Edward J.
1998 *ARPA Evaluation of Eight Sites in the Wyemaha Valley Bentonite Expansion Project, Churchill County, Nevada*. Prepared for Specialty Clays Corporation.
Stoner, Edward J. and Thomas F. Langheim
1998 *A Class III Cultural Resource Inventory of the Equatorial Tonopah Copper Mine Expansion, Nye County, Nevada.* Prepared for Environet, Inc.
Stoner, Edward J.
1998 *A Stage I Overview of Cultural Resources for the Cultler and Trinox Ranches Land Exchange Project in Lyon County, Nevada*. Prepared for Thiel Engineering Consultants.
Stoner, Edward J., Steven F. Mehls, Mary K. Rusco, and Donald L. Hardesty
1998 *Beyond the Keystone Junction -- 9,000 Years of Mining in Eastern Nevada: A Historic Context for the Robinson District, White Pine County, Nevada.* Prepared for BHP Copper Company.
Lennon, Thomas J., Edward J. Stoner, Mary K. Rusco, and Steven F. Mehls
1998 *A Plan to Perform Data Recovery at Sites CrNV-46-7679, CrNV-46-7687, CrNV-46-7691, and CrNV-46-7694 White Pine County, Nevada*. Prepared for BHP Copper Company.
Stoner, Edward J., and Steven F. Mehls
1998 *An Archaeological Inventory of Seven Parcels for the BHP Robinson Operation, White Pine County, Nevada*. Prepared for BHP Copper Company.
Christian, Leif, and Edward J. Stoner
1998 *An Archaeological Inventory of the Pittston Nevada Gold Company's Boyd Canyon Project, Nye County, Nevada.* Prepared for Environmental Management Associates.
Langheim, Thomas F., and Edward J. Stoner
1998 *An Archaeological Inventory of 4.2 Acres Near the Junction of South Virginia Street and Foothill Road.* Prepared for JBR Environmental Consultants.

Stoner, Edward J., Renee Kolvet, Steven F. Mehls, and Patrick Phillips
1998 *An Archaeological Inventory of 6.1 Miles of Proposed Perimeter Fence and a 60 Acre Parcel for the BHP Robinson Operation, White Pine County, Nevada*. Prepared for BHP Copper Company.

Stoner, Edward J., and Thomas F. Langheim
1997 *A Class III Cultural Resource Inventory of 1280 Acres for Getchell Gold Corporation, Humboldt County, Nevada*. Prepared for Getchell Gold Corporation.

Stoner, Edward J., and Thomas F. Langheim
1997 *A Class III Cultural Resource Inventory of 620 Acres Near the Getchell Gold Mine, Humboldt County, Nevada.* Prepared for Getchell Gold Corporation.

Stoner, Edward J., and Thomas F. Langheim
1997 *A Class III Cultural Resource Inventory of 529 Acres for Getchell Gold, Humboldt County, Nevada.* Prepared for Getchell Gold Corporation.

Stoner, Edward J., and Thomas F. Langheim
1997 *A Cultural Resource Inventory of 220 Acres for the Fuller Lake Project, Washoe County, Nevada.* Prepared for Jeff Codega Planning/Design, Inc.

Stoner, Edward J., Mary K. Rusco, Steven F. Mehls, and Geoffrey Cunnar
1997 *A Cultural Resource Inventory of 2,500 Acres of Land in the Vicinity of Tuscarora, Elko County, Nevada.* Prepared for Newcrest Resources, Inc.

Stoner, Edward J., Steven F. Mehls, and Mary K. Rusco
1997 *A Data Recovery Plan for Archaeological Sites in the Big Springs Ranch Land Exchange Project in Elko County, Nevada*. Prepared for Land and Water Conservation, Inc.

Stoner, Edward J., and Mary K. Rusco
1997 *A Plan to Perform Data Recovery at Sites CrNV-46-6695, -6712, -6777, and -7408, White Pine County, Nevada*. Prepared for BHP Copper Company.

Kolvet, Renee, Edward J. Stoner, Steven F. Mehls, and Patrick Phillips
1997 *A Class III Cultural Resource Inventory of BLM Parcels for the Round Mountain Environmental Assessment, Nye County, Nevada*. Prepared for Round Mountain Gold Corporation.

Stoner, Edward J., Thomas F. Langheim, and Steven F. Mehls
1997 *An Archaeological Inventory of the Casey Property In Washoe County, Nevada*. Prepared for WESTEC, Inc.

Stoner, Edward J., Geoffrey Cunnar, and Mary K. Rusco
1997 *A Plan to Perform Data Recovery at Site CrNV-03-4998 Wahsoe County, Nevada.* Prepared for Pyramid Lake Paiute Tribe.

Stoner, Edward J. Steven F. Mehls, and Geoffrey Cunnar
1997 *A Plan to Perform Data Recovery at Sites CrNV-46-6654, CrNV-46-7361, CrNV-46-7396, CrNV-46-7405, and CrNV-46-7406 White Pine County, Nevada*. Prepared for BHP Copper Company.

Mehls, Steven F., Mary K. Rusco, and Edward J. Stoner
1997 *A Prehistoric, Ethnohistoric, and Historic Context for the Evaluation of Sites for the Proposed Class III Cultural Resource Inventory of the Tuscarora Mining District in Elko County, Nevada*. Prepared for Newcrest Resources, Inc.

Mehls, Steven F., Edward J. Stoner, and Geoffrey E. Cunnar
1997 *An Archaeological Inventory of 33 Acres of Land Including the Deep Ruth Shaft Complex and the Kennecott Shop Complex for the BHP Robinson Project White Pine County, Nevada.* Prepared for BHP Copper Company.

Stoner, Edward J.
1997 *A Class III Cultural Resource Inventory for the Proposed Sun Valley Elementary School Washoe County, Nevada*. Prepared for Washoe County School District.

Stoner, Edward J.
1997 *A Class III Cultural Resource Inventory for the Proposed Spanish Springs Land Exchange Washoe County, Nevada*. Prepared for Pyramid Lake Paiute Tribe.

Stoner, Edward J., Steven F. Mehls, and Mary K. Rusco
1997 *A Cultural Resource Inventory of BLM Parcels for the Proposed Big Springs Ranch Land Exchange Elko County, Nevada*. Prepared for P.R. Taylor.

Stoner, Edward J.

1997 *A Cultural Resource Inventory of Six Seep Areas Within the Little Mondeaux Ranch, Douglas County, Nevada*. Prepared for WESTEC, Inc.

McLane, Alvin, and Edward J. Stoner
1996 *A Class III Cultural Resource Inventory of a 120 Acre Parcel in Owens Valley, Inyo County, California*. Prepared for Umetco Minerals Corporation.

Stoner, Edward J.
1996 *A Treatment Plan for Sites 26Wp2418, 26Wp2353, 26Wp2965, and 26Wp2336, White Pine County, Nevada.* Prepared for BHP Copper Company.

Hardesty, Donald L., Edward J. Stoner, and Steven F. Mehls
1996 *A Treatment Plan for Contributing Elements to 27 Sites Recommended Eligible to the National Register of Historic Places Located Within the Mineral Ridge Historic Mining District Esmeralda County, Nevada.* Prepared for Mineral Ridge Resources, Inc.

Stoner, Edward J., Steven F. Mehls, Charles W. Wheeler, and Renee Kolvet
1996 *A Class III Cultural Resource Inventory of BLM Parcels Within the Wolf Springs Ranch, Huerfano County, Colorado.* Prepared for Michael J. Mollerus, LTD.

Stoner, Edward J., and Steven F. Mehls
1995 *A Treatment Plan for Sites CrNV-46-7620 and CrNV-46-7623, White Pine County, Nevada*. Prepared for BHP Copper Company.

Stoner, Edward J., and Steven F. Mehls
1995 *Addendum to a Class III Inventory of the Radcliff Project Area, Panamint Mountains, Inyo County, California*. Prepared for Compass Minerals.

Stoner, Edward J.
1995 *An Archaeological File Search and Field Reconnaissance for the Cold Spring Valley Project, Washoe County, Nevada*. Prepared for Priske-Jones, Inc.

Stoner, Edward J., Renee Kolvet, and Steven F. Mehls
1995 *An Archaeological Inventory of the Magma Robinson Project Proposed Mine Dump Expansion, White Pine County, Nevada*. Prepared for Magma Nevada Copper.

Kolvet, Renee C., Steven F. Mehls, and Edward J. Stoner
1995 *An Archaeological Inventory of the Magma Robinson Project Proposed Perimeter Fence, White Pine County, Nevada.* Prepared for Magma Nevada Copper.

Stoner, Edward J.
1995 *A Class III Cultural Resource Inventory of Briggs Discovery Site #1 (BDS-1) Inyo County, California*. Prepared for Canyon Resources Inc.

Stoner, Edward J. and Steven F. Mehls
1995 *A Treatment Plan for a Contributing Element of the Nevada Northern Railroad (CrNV-46-546) White Pine County, Nevada.* Prepared for Magma Nevada Copper.

Stoner, Edward J.
1995 *Archaeological Monitor and Discovery Plan for the Las Vegas Paving Corporation's Sunridge Project, Douglas County, Nevada.* Prepared for Las Vegas Paving Corporation.

Stoner, Edward J. and Mary K. Rusco
1995 *A Data Recovery and Treatment Plan for Sites in the Las Vegas Paving Corporation Sunridge Project, Douglas County, Nevada*. Prepared for Las Vegas Paving Corporation.

Stoner, Edward J.
1994 *A Class III Cultural Resource Inventory of a 13 Mile Powerline Right-of-Way, White Pine County, Nevada*. Prepared for Placer Dome U.S. Bald Mountain Mine.

Stoner, Edward J., and Mary K. Rusco
1994 *A Plan to Perform Data Recovery at Site CrNV-46-7407, White Pine County, Nevada*. Prepared for the Magma Copper Company.

Stoner, Edward J.
1994 *A Plan to Perform Data Recovery on Site 5TL464, Teller County, Colorado*. Prepared for the Cripple Creek & Victor Gold Mining Company.

Stoner, Edward J.
1994 *Letter Report on the Results of Additional Shovel Test Probes on Site 5TL464, Teller County, Colorado*. Prepared for Cripple Creek & Victor Gold Mining Company.

Stoner, Edward J.
1994 *A Class III Cultural Resources Inventory of the Prehistoric Resources in Arequa Gulch Teller County, Colorado*. Prepared for Cripple Creek & Victor Gold Mining Company.
Stoner, Edward J.
1994 *A Plan to Perform Surface and Subsurface Evaluation and Potential Data Recovery at Site 26Do239, Douglas County, Nevada*. Prepared for Las Vegas Paving Corporation.
Kolvet, Renee, and Edward J. Stoner
1994 *A Class III Cultural Resources Inventory of Six Prospective Open Pit Sites for American Pozzolan Corporation Near Hallelujah Junction, Lassen County, California*. Prepared for American Pozzolan Corporation.
Stoner, Edward J., R. Kolvet, R. Peterson, R. Johnson
1994 *A Cultural Resource Survey of 2125 Acres for the Santa Fe Pacific Dry Hills Pass Project, Humboldt County, Nevada*. Prepared for Santa Fe Pacific Mining.
Stoner, Edward J., and Steven F. Mehls
1994 *A Class III Cultural Resource Inventory of the Briggs Project Expansion, Inyo County, California*. Prepared for Canyon Resources Corporation.
Stoner, Edward J., Steven F. Mehls, and Robert R. Peterson
1994 *Class III Cultural Resource Inventory of 18 Parcels and NRHP Evaluations of 25 Previously Recorded Sites For the Magma Robinson Project White Pine County, Nevada*. Prepared for Magma Nevada Copper.
Hardesty, Donald L., Steven F. Mehls, Edward J. Stoner, and Monique Kimball
1994 *Riepetown: A Data Recovery Report for the Historic Townsite of Riepetown White Pine County, Nevada*. Prepared for Magma Nevada Copper.
Kolvet, Renee, and Edward J. Stoner
1994 *National Register Evaluation and Damage Assessment of Site 26CH1040 for Naval Air Station Fallon, Churchill County, Nevada*. Prepared for Commander, Western Division Naval Facilities Engineering Command.
Lennon, Thomas J., and Edward J. Stoner
1994 *A Class III Cultural Resource Inventory of the Proposed Repeater Facility Site for Canyon Resources Inc., Inyo County, California*. Prepared for Canyon Resources, Inc.
Lennon, Thomas J., and Edward J. Stoner
1994 *A Class III Cultural Resource Inventory of Two Potential Clay Sources for Canyon Resources Inc., Inyo County, California.* Prepared for Canyon Resources, Inc.
Stoner, Edward J.
1993 *Archaeological Survey of the Proposed LGMI Basalt Quarry and Associated Access Roads, Lassen County, California*. Prepared for Lassen Gold Mining, Inc.
Hardesty, Donald L., Steve Mehls, Ed Stoner, Tom Lennon, and Richard Carrillo
1993 *Hayden Hill Data Recovery Report for Lassen Gold Mining, Inc. Hayden Hill Mine Project, Lassen County, California*. Prepared for Lassen Gold Mining Inc.
Stoner, Edward J.
1993 *A Class III Cultural Resource Inventory of 2.8 miles of Access Road and Drill Pad Site for the Anschutz Corporation Troy Canyon Project Christian Spring Federal #11-3 Nye County, Nevada*. Prepared for the Anschutz Corporation Denver, Colorado.
Stoner, Edward J. and Robert F. Johnson
1992 *A Class III Cultural Resource Inventory of the USMX Horseshoe/Galaxy Project White Pine County, Nevada*. Prepared for USMX Ely, Nevada.
Stoner, Edward J.
1992 *An Archaeological Inventory and Recordation of Features Associated With the Proposed Buck Mountain Unit #36-1 Project White Pine County, Nevada.* Prepared for the Anschutz Corporation Denver, Colorado.
Stoner, Edward J.
1992 *A Class III Cultural Resource Inventory of the Proposed North Springs Estates Development Washoe County, Nevada.* Prepared for North Valleys Consultants Sparks, Nevada.
Peterson, Robert R., and Edward J. Stoner
1991 *A Class III Cultural Resource Inventory of the Round Mountain Gold New Dedicated Pad Expansion in Nye County, Nevada*. Prepared for Round Mountain Gold, P.O Box 480 Round Mountain, Nevada.

Stoner, Edward J., and Robert Peterson
1991 *A Cultural Resource Inventory Report on the Phase II Portion of the USMX Yankee Project in White Pine County, Nevada.* Prepared for USMX, P.O. Box 809 Ely Nevada 89301.
Stoner, Edward J.
1991 *A Class III Cultural Resource Inventory of Proposed Road, Fence, and Powerline Realignment in Humboldt County, Nevada.* Prepared for Nevada Gold Mining, Inc.
Peterson, Robert R., and Edward J. Stoner
1991 *A Cultural Resource Inventory Report on the Phase I Portion of the USMX Yankee Project in White Pine County, Nevada*. Prepared for USMX, Inc.
Wheeler, Charles W., Edward J. Stoner and Robert R. Peterson
1991 *Data Recovery at the Lake Range Quarry.* Prepared for AMAX Wind Mountain Mining, Inc.
Wheeler, Charles W., T.J. Lennon, and Edward J. Stoner
1990 *A Class III Cultural Resource Inventory of a Well Site, Access Road, and Collection System for Tonopah Public Utilities*.
Lennon, Thomas J., Steven Mehls, Edward J. Stoner, and Mary Rusco
1990 *A Data Recovery Plan for the Hayden Hill Project Lassen County, California*. Prepared for Lassen Gold Company.
Stoner, Edward J., Thomas J. Lennon, and Mary Rusco
1990 *A Class III Cultural Resource Inventory of the Sleeper Mine Wetlands Enhancement Project Stage II*. Prepared for Amax Gold Corp. Manuscript on file Bureau of Land Management, Winnemucca District.
Stoner, Edward J.
1990 *A Cultural Resource Inventory of 15 Drill Hole Locations for the AMAX Wind Mountain Project, Washoe County, Nevada*.
Stoner, Edward J.
1990 *A Class III Cultural Resource Inventory of Horizon Gold Corporation's Hope Butte Project Expansion Parcel and Access Road Malheur County, Oregon*
Stoner, Edward J. and R. Peterson
1990 *A Cultural Resource Inventory of Proposed Access Roads and Shovel testing of Previously Recorded Sites in the Grassy Mountain Project Area Malheur County, Oregon.* Prepared for Atlas Precious Minerals, Co.
Stoner, Edward J.
1990 *A Class III Inventory of 3 Expansion Parcels and Access Roads for the Chevron Exploration's Quartz Mountain Project, Malheur County, Oregon*. Prepared for Chevron Exploration Co.
Stoner, Edward J., and Robert Peterson
1990 *A Class III Inventory of the Little Antelope Creek Road, Elko County, Nevada*. Prepared for Galactic Operating Company.
Lennon, Thomas J., Mary Rusco, Edward J. Stoner
1990 *A Class III Survey of the Sleeper Wetlands Enhancement Project, Humboldt County, Nevada*. Prepared for Amax Gold Corporation.
Lennon, Thomas J., S.M. Mehls, and Edward J. Stoner
1990 *A Class III Survey and Testing Program for the Hayden Hill Project, Lassen County, California*. Prepared for Amax Gold Corporation.
Stoner, Edward J.
1988 *A Class I Cultural Resource Inventory of Portions of Aspen and Buttermilk Mountains, Pitkin County, Colorado.* Prepared for Aspen Ski Corporation.
Stoner, Edward J.
1988 *Draft Report. Lithic Analysis of sites 39SL8, 39SL12, 39SL13, and 39SL19 Smithsonian River Basins Survey.* Prepared for Huerfano Consultants.
Stoner, Edward J., S.F. Mehls, and K.D. Lindsey.
1988 *Cultural Resource Inventory of the Russellville Bridge Replacement Project, Douglas County, Colorado*. Prepared for Kirkam, Michael, and Associates.
Stoner, Edward J., and Charles Wheeler.
1988 *A Cultural Resource Inventory of Well Pad Aexco Federal 13-35 Weld County, Colorado.* Prepared for Aexco Petroleum.

Wheeler, Charles W., T.J. Lennon, Wm Lane Shields, and E. Stoner.
1987 *Archaeological Data Recovery at Sites 48LN529, 48LN1674 and 48LN1685*. Prepared for Northwest Pipeline Corporation.
Wheeler, Charles W., G. Firebaugh, W.L. Shields, E. Wade and E. Stoner.
1986 *5500 Years on the Great Plains-Great Basin Frontier: An Excavation of Sites in Section 14. Prepared for Exxon Corporation, USA*.

Environmental Impact Statements

2009-2010 Project Manager in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources for the Mount Hope EIS in Eureka County, Nevada

2008 Project Manager in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources for the U.S. Highway 395 Connector/Pyramid Highway Project EIS in Washoe County, Nevada.

2006-2007 Project Manager in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources for the Round Mountain EIS in Nye County, Nevada.

2002-2003 Project Manager in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources for the Weber Dam EIS in Mineral County, Nevada.

2001 Project Manager in charge of Native American consultation for the Speedway Interchange Project, in Clark County, Nevada.

2001 Project Manager in charge of Native American consultation for the I-80 - Patrick Interchange Project, Washoe County, Nevada.

2001 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources for the Weber Dam EIS in Mineral County, Nevada.

2000 Project Manager in charge of Native American consultation for the Auto Mall Interchange Project, Clark County, Nevada.

2000 Project Manager in charge of Native American consultation for the Lake Mead Blvd. widening project, Clark County, Nevada.

1999 Project Manager in charge of Native American consultation for the Reno Railroad Corridor Project, Washoe County, Nevada.

1997 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources and paleontological resources for Getchell Gold in Humboldt County, Nevada.

1996 Project Archaeologist in charge of coordination of ethnographic research Native American consultation, and Native American monitor of significant prehistoric sites for Homestake Mining Corp. Ruby Hill Project in Lander County, Nevada.

1996 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources and paleontological resources for Round Mountain Gold's Round Mountain Environmental Assessment Project in Nye County, Nevada. Also in charge of coordination of ethnographic research and Native American consultation.

1995 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources and paleontological resources for Santa Fe Pacific Gold Corp. Twin Creeks Project in Humboldt County, Nevada. Duties also include coordination of ethnographic research and Native American consultation.

1995 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources and paleontological resources for Battle Mountain Gold Corp. Phoenix Project in Lander County, Nevada.

1995 Project Archaeologist in charge of coordination of ethnographic research and Native American consultation for Homestake Mining Corp. Ruby Hill Project in Lander County, Nevada.

1994 Project Archaeologist in charge of data collection and verification, description of the affected environment, impact assessment and mitigation, and assessment of cumulative effects for cultural resources and paleontological resources for Round Mountain Gold's Round Mountain EIS Project in Nye County, Nevada. Also in charge of coordination of ethnographic research and Native American consultation.

Professional Papers:

1993 Riepetown: Taking Archaeology to the Extreme. Paper presented to the November 10, 1993 meeting of the Am-Arcs of Nevada, Reno.

1997 The Rosegate Site: A Late Archaic Projectile Point Manufacture and Camp Site in Giroux Wash, Southern White Pine County, Nevada. The Results of Archaeological Investigations. Paper presented at the 26th annual Conference of the Nevada Archaeological Association, Las Vegas, Nevada, March 15, 1997.

1998 Horizontal Zonation, Function, and Regional Affiliation in Two Upland, Multicomponent, Western Stemmed Tradition Sites Near Giroux Wash, White Pine County, Nevada. Paper presented with Charles W. Wheeler at the 27th annual Conference of the Nevada Archaeological Association, Eureka, Nevada, March 14, 1998.

1998 Intersubjective Time in Native American Consultation: An Avenue to Effective Communication. Paper presented with Mary Rusco at the 27th annual Conference of the Nevada Archaeological Association, Eureka, Nevada, March 14, 1998.

1998 Broken Hill: The Rosegate Type Site? Poster presented at the 26th Great Basin Anthropological Conference, Bend, Oregon, October 9, 1998.

1999 Hunter-Gatherer Subsistence and Mobility in the Great Basin Middle Archaic: A View From the Housepit Site, White Pine County, Nevada. Paper Presented at the 28th annual Conference of the Nevada Archaeological Association, Reno, Nevada, March 20, 1999.

2000 How to Explain the Inexplicable. Paper Presented with Mary Rusco at the 29th annual Conference of the Nevada Archaeological Association, Ely, Nevada, March 11, 2000.

2002 Modeling Lithic Terrane: An Eastern Nevada Example. Paper Presented at the 31st Annual Conference of the Nevada Archaeological Association, Carson City, Nevada, April 27, 2002.

2004 Urban Archaeology in "The Biggest Little City": Reno's Train Trench Project. Paper Presented with Mary Ringhoff at the 37th Annual Society for Historical Archaeology Conference on Historical and Underwater Archaeology, St. Louis, Missouri, January 11, 2004.

2004 Urban Archaeology in "The Biggest Little City": Reno's Train Trench Project. Paper Presented with Mary Ringhoff at the 33rd Annual Conference of the Nevada Archaeological Association, Carson City, Nevada, April 17, 2004.

2004 The Archaeology of the Daylight site (26Wa7522): A Deeply Stratified Site in the Truckee River Flood Plain. Paper presented at the 29th Great Basin Anthropological Conference, Sparks, Nevada, October 16, 2004.

2005 Archaeology in the Biggest Little City: a View from the Train Trench. Course presented to the University of Nevada, Reno Elder College, Reno, Nevada, January 31, 2005.

2005 Lithic Conveyance Zones and Early Land Use Strategies in the Eastern Great Basin: An Examination of the Lithic Terrane. Paper presented at the 70th Annual Meeting of the Society for American Archaeology, Salt Lake City, Utah, April 1, 2005.

2005 Consultation and Consensus in the Biggest Little Cultural Resource Project in the World. Keynote Address for the 34th Annual Conference of the Nevada Archeological Association, Tonopah, Nevada, April 16, 2005.

2005 Consultation and Consensus on the Reno ReTRAC Project. Paper presented at the Nevada Street and Highway Conference, Las Vegas, Nevada, May 18, 2005.

2005 Archaeology in the Biggest Little City: a View from the Train Trench. Lecture presented to the Nevada Association of Land Surveyors, Reno, Nevada, October 12, 2005.

2005 Archaeology in the Biggest Little City: a View from the Train Trench. Lecture presented to the Eastside Foresters Association, Reno, Nevada, November 16, 2005.

2006 "The Matter Involves the Welfare of Black People." African-American-Owned Businesses in Segregated Reno, Nevada 1930-1970. Paper presented with Mary Ringhoff for the Society of Historical Archaeology, Sacramento, California, January 17, 2006.

2006 9,000 Years of Mining in the Egan Range, White Pine County, Nevada. Paper presented at the 35th Annual Conference of the Nevada Archeological Association, Mesquite, Nevada, April 8, 2006.

2006 Digging Smarter: CRM and Buried Open Sites in the Great Basin. Paper presented at the Plenary Session of the 30th Great Basin Anthropological Conference, Las Vegas, Nevada, October 19, 2006.

2006 Painted Stone, Broken Stone: Worldview and Site Formation Processes at 26Wa7522, Washoe County, Nevada. Paper presented at the 30th Great Basin Anthropological Conference, Las Vegas, Nevada, October 20, 2006.

2007 26WP4629, A Heat Treatment and Projectile Point Manufacture Site Near Ely, Nevada: The Rosegate Type Site. Paper presented at the 36th Annual Conference of the Nevada Archeological Association, Ely, Nevada, April 21, 2007.

2007 The Aultman Mine and Mill Traveling Exhibit: An Examination of Process and Development. Paper presented with Amie Gray for the 36th Annual Conference of the Nevada Archeological Association, Ely, Nevada, April 21, 2007.

2007 Francis Humphrey Lecture Series of the Nevada State Museum: Historic Archaeological Discoveries Unearthed during the Reno Train Trench Project. Presented on May 22, 2007, Carson City, Nevada

2007 The Treasures of ReTRAC: Historic Preservation Successes in the Biggest Little Urban Archaeology Project in the World. Presented at the Nevada Historical Society Evening Lecture Series on May 29, 2007.

2008 The Treasures of ReTRAC: Historic Preservation Successes in the Biggest Little Urban Archaeology Project in the World. Presented to the Nevada State Retired Teachers Association. April 2, 2008.

2008 Trend Surface Analysis of Sites in the Robinson Mining District near Ely, Nevada: An Examination of Middle to Late Archaic Continuity and Economy. Paper presented at the 37th Annual Conference of the Nevada Archaeological Association, Minden, Nevada, April 12, 2008.

2008 The Deep Ruth Headframe: An Iconic Structure near Ruth, Nevada. Paper presented at the 31st Great Basin Anthropological Conference, Portland, Oregon, October 9, 2008.

2010 Of Palimpsests and Logical Fallacies: A New Look at Open Site Archaeology in the Great Basin. Paper presented to the University of Nevada Anthropology Club, November 15, 2010.

2010 A New Look at Open Site Archaeology in the Great Basin. Paper presented to the Nevada AmArcs Society, November 16, 2010.

2010 Nine Thousand Years of Mining in the Egan Range, White Pine County, Nevada, USA: An Archaeology of Place. Paper presented to the First International Conference on Pre-Hispanic Mining in the Americas, Taltal and San Pedro de Atacama, Chile, December 9, 2010.

2011 Fire Creek: A New Look at Old Dirt on Alluvial Fans in the Great Basin. Paper Presented at the 76th Annual Conference of the Society for American Archaeology, Sacramento, California, April 3, 2011. Co-written with Geoffrey Cunnar.

2012 The Symbolic Importance of Color Choices in Stone Raw Material: A Case Study from Late Neolithic China and the Paleoarchaic Period in the Great Basin, USA. Paper Presented at the 77th Annual Conference of the Society for American Archaeology, Memphis, Tennessee, April 19, 2012. Co-written with Geoffrey Cunnar and Luan Fengshi.

2012 Three Roles, Three Projects, and up to Nine Perspectives on Compliance with NEPA and Section 106. Panel Discussion with Heather Miller, Mark Demuth, Debbie Lassiter, and Edward J. Stoner at the 37th Annual Conference of the National Association of Environmental Professionals, Portland, Oregon, May 23, 2012.

2012 Reno and an Archaeology of Place. Paper presented to the Nevada AmArcs Society, September 12, 2012.

2012 Open Site Archaeology in the Great Basin: Buried Soils at Fire Creek, Crescent Valley, Lander County, Nevada. Paper presented at the 33rd Great Basin Anthropological Conference, Stateline, Nevada, October 18, 2012. Co-written with Thomas F. Bullard, Geoffrey Cunnar, and Mark B. Estes.

2013 New Stuff, Old Stuff: An Archeology of Place. Lecture presented for the Burning Man Earth Guardians, Black Rock City, Nevada, August 28, 2013.

2014 New Stuff, Old Stuff: An Archeology of Place. Lecture presented for the Burning Man Earth Guardians, Black Rock City, Nevada, September 1, 2014.

2014 Lost in the Data: A Reassessment of the Presence of Children a Quarry Heat Treatment and Projectile Point Manufacturing Sites in White Pine County, Nevada. Paper presented at the 78th Annual Conference of the Society for American Archaeology, Austin Texas, April 12, 2014.

2016 Processing, Power, Teaching and Identity, The Utilitarian and Ritual Use of Artifacts from a Middle Archaic Shaman's House in the Great Basin. Paper presented at the 80th Annual Conference of the Society for American Archaeology, Orlando Florida, April 12, 2016. Co-author with Geoffrey Cunnar.

2016 Reconstructing a Paleoarchaic Afternoon 12,000 years ago, at Fire Creek Nevada. Paper presented at the 35th Great Basin Anthropological Conference, Reno, Nevada, October 15, 2016. Co-author with Geoffrey Cunnar, and Thomas F. Bullard.

References:

References provided upon request.

APPENDIX C
WCRM'S LABORATORY MANUALS

WCRM LITHICS LABORATORY MANUAL
NEWMONT LONG CANYON

February 2, 2017
Revised March 20, 2017

PHASE II. DEBITAGE COUNTS AND WEIGHTS

The second phase of the prehistoric laboratory analysis is a complete count of all debitage by material type, the separation of complete from incomplete flakes/shatter, and obtaining gross weights and thus giving us the ability to obtain average piece weights of both complete and incomplete flakes/shatter for each provenience.

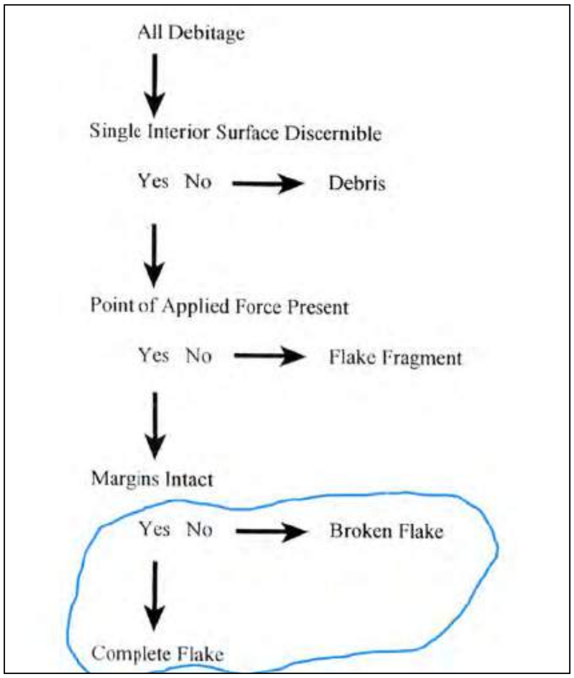
Artifacts were recovered from a variety of contexts. Some were recovered from 1 x 1 m units located upon discovery features, but most were recovered from larger 5 x5 grids that were surface collected and subsequently excavated. Excavation was conducted in 10 cm levels. Finally, some artifacts were collected from the general ground surface at various sites. Below, the individual provenience and debitage data to be recorded are described in detail in order to permit coding into the database. In the case of provenience-related attributes, the coding is almost identical to that of tools.

Please do not leave any fields blank. If a field does not apply to a certain artifact, put a dash (-) in that space. For example, if an artifact was not point-provenienced, enter a dash (-) in the ProvN/Prov E and Depth fields. However, if a field has a list of codes to choose from, you MUST choose one of those codes. If there does not appear to be an appropriate code for a particular artifact, see the lab supervisor about adding one. Each lot find of debitage gets a catalog number, whether the bag has 1 or 1000 flakes.

Phase II of the prehistoric laboratory analysis typically includes some separation of non-cultural material, tools, and ancillary field samples from the bags of lot debitage. Anything removed from a bag of lot debitage as a tool or other sample will need to be placed in a new artifact bag and assigned a new FS/AFS number. Examples of these kinds of artifacts include flaked stone tools, ornaments, quartz crystals, faunal bone, etc. All provenience information must be transferred to the new bag. The new item should be entered into the inventory and placed into an appropriate box depending on its provenience and artifact/sample class. Non-cultural materials will either be discarded or sometimes placed in a separate box for such items after the lab supervisor has reviewed them. If you notice anything unusual in the debitage collection during the sorting please note in your lab book or comments field and bring to the attention of a lab supervisor. This may include observations as an unusual abundance of heat treated material, high amounts of radially broken incomplete flakes, large flake sizes etc. These types of observations may be important to better understanding the reduction trajectories and technology at the site.

All non-diagnostic shatter (NDS) and incomplete flakes will be counted, weighed and bagged separately from the complete flakes. Generally, these items can be placed into a small plastic bag that is then placed inside of the original artifact bag. If this is not possible, the NDS and incomplete flakes can be placed in a completely separate bag, taking care to transfer all provenience information to the new bag. It is critically important that all provenience information be transferred correctly. Please double check your work!

Complete flakes are defined as those flakes that possess a recognizable platform, a single ventral surface and at least one lateral margin and a termination. Flakes that exhibit siret breaks are considered complete as long as a portion of the platform remains. Note that it is possible with this definition to have complete flakes with certain radial breaks as well as intentionally broken flakes, as long as they retain a portion of the platform. If you encounter siret flakes, deliberately broken flakes with a platform or flakes with a radial break and a platform, consider them complete.



Sullivan and Rosen's (1985:759) four types of debitage. Our definition of "complete" flakes will include their broken and complete flake categories.

CATALOG NUMBER: This is a number assigned to each artifact (or lotfind of artifacts, in the case of lot debitage) and its purpose is to make every data entry unique. Catalog numbers are tracked using the digital artifact inventory; please take care to avoid assigning duplicate catalog numbers.

BOX NUMBER: Number of box where artifact is located. Always write the box number on the bag or envelope so that if the artifact is somehow separated from the collection it may be returned to its original box.

SPECIMEN NUMBER: This number is assigned when an artifact is sent for outside analyses. If not applicable, enter "-".

ANALYST'S INITIALS (AnInit): Put your initials here.

ANALYSIS DATE (AnDate): The date the analysis was done.

<u>PROVENIENCE DATA</u>:

DISCOVERY NUMBER: Enter the discovery number that was assigned to the site. If no discovery number was assigned, enter a dash "-".

AGENCY NUMBER: CrNV-XX-XXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

STATE NUMBER: 26EkXXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

LOCUS: Enter the locus designation, if applicable.

CONCENTRATION NUMBER (Conc): Enter the concentration number, if applicable.

SHOT NUMBER: Shot number is typically only assigned for artifacts collected using a total station.

BACKHOE TRENCH NUMBER (BHTrench): Enter the backhoe trench number, if applicable.

AUGER TEST: If item was recovered from an auger test, put the number of the auger test from which the item was collected.

SHOVEL TEST: Designation of the shovel test unit, if applicable.

EXCAVATION/TEST UNIT (Ex/Test Unit): Enter the Excavation or Test Unit number, if applicable.

GRID: If the material was recovered from a feature or unit in one of the collection grids, put the grid designation here.

GRID N: This refers to the northing, or the north coordinate, of the southwest corner of the 1 m x 1 m **excavation unit.** The excavation grid coordinates are always justified to the southwest corner which is directly related to the primary collection grid datum which has been given the arbitrary Cartesian coordinates of 100 m north/100 m east. In other words, a unit with a grid north designation of 105 north is five meters north of the primary collection grid datum. Enter only integer values (do not add "N").

GRID E: This refers to the easting, or the east coordinate of the southwest corner of the 1 m x 1 m **excavation unit**. This is encoded just like a north coordinate (e.g., a unit with a grid east designation of 105 east is five meters east of the primary collection grid datum). Use only the integer value.

PROVENIENCE NORTHING/PROVENIENCE EASTING (PROVN/PROVE):
Horizontal provenience of a point-provenienced specimen, measured to the nearest centimeter. Provenience will be expressed as meters north and east, i.e. N100.25/E99.35, but

only the number needs to be recorded (do not add “N” or “E”). Items collected with GPS units will typically have UTMs associated with them and they should be added to this field as well.

PROVENIENCE ELEVATION (PROV ELEV): Absolute elevation of a point-provenienced specimen, measured to the nearest centimeter relative to the local excavation datum. This field should only be used when PROVN/PROVE are used.

UNIT LEVEL: For excavation units: this refers to the arbitrary 10 cm levels numbered sequentially from the surface. Surface artifacts from excavation units are coded as level “0“. TElev and BElev are the top and bottom elevations of the level.

For surface collected artifacts in 1 x 1 m units within the grids: code as level “0” and put a dash in TElev and BElev. For artifacts collected from the surface throughout the site: code as level “0” and put a dash in TElev and BElev.

UNIT STRATUM: Enter the stratum designation, if applicable. Otherwise enter “-“. If you notice that an artifact from a particular site does not have a stratum entry, but all the others do, then take the time to find the correct data in the appropriate records.

FIELD SPECIMEN NUMBER: Enter the field specimen number.

ANCILLARY FIELD SPECIMEN NUMBER: Enter the field specimen number.

TELEV: The top elevation of the level in which the artifact was located is recorded for excavated artifacts.

BELEV: The bottom elevation of the level in which the artifact was located is recorded for excavated artifacts.

FEATURE NUMBER: Feature number, if artifact is from a feature. Otherwise enter “-“.

FEATURE PORTION: Horizontal provenience of the feature, e.g. N1/2 or NE1/4.

FEATURE LEVEL: this refers to the arbitrary 10 cm levels numbered sequentially from the origin (or truncated surface) of the feature.

FEATURE STRATUM: stratum designation assigned to feature depsosits.

DEBITAGE DATA:

CONDITION: Separate each lot find into complete and incomplete flakes using the categories below:

> **Complete -** Use if the flakes have a recognizable platform, a single ventral surface, and at least one lateral margin and a termination.

Incomplete - Those flakes missing the attributes of a complete flake. For example: lateral, medial, distal fragments are incomplete flakes. Errailure "flakes" would also be considered incomplete flakes.
Non-diagnostic shatter - Use for debris if the ventral and dorsal surfaces cannot be distinguished.
Indeterminate. Use sparingly.

MATERIAL TYPE: Separate each lotfind into material types.

Chert
Fine Grained Volcanic Rock (FGVR)
Obsidian
Quartzite
Other (specify type in comments)

REDUCTION: Separate each lotfind into reduction types using the categories below:

Primary – Primary flakes retain 100% cortex on the dorsal surface.
Secondary – Secondary flakes exhibit some cortex on the dorsal surface.
Tertiary – Tertiary flakes have no cortex on the dorsal surface.
Indeterminate – A flake may be indeterminate as to stage of reduction if you cannot distinguish between material flaw/inclusion and cortex, for example. There should be very few items that are actually indeterminate.
Non-diagnostic shatter – Something may be non-diagnostic shatter if the ventral and dorsal surfaces cannot be distinguished.
Incomplete flake – Do not assign reduction stage for incomplete flakes.

COUNT: Obtain a count

WEIGHT: Obtain a weight to the nearest .01g.

Sullivan, Alan P. and Kenneth C. Rozen
1985 Debitage Analysis and Archaeological Interpretation. *American Antiquity* 50(4):755-779.

WCRM LITHICS LABORATORY MANUAL
NEWMONT LONG CANYON

February 3, 2017
Revised April 11, 2017

PHASE III. TECHNOLOGICAL ANALYSIS OF DEBITAGE

The third phase of the prehistoric laboratory analysis is the formal, technological attribute analysis of debitage. Typically, on our excavations debitage is collected from both general surface collections as well as systematic excavation of 1-x-1 m units. WCRM generally excavates 5-x-5m to 10-x-10 m excavation blocks as well as test units which can be located either within or outside of the excavation grids. During the Newmont project, numerous individual 1 x 1m units were excavated at the location of Discovery features. Occasionally artifacts are collected from other proveniences such as auger probes, backhoe trenches, and shovel tests. If you note any provenience information on a bag that is not being collected on the forms, you should check with a laboratory supervisor as to whether any modifications are needed. Below, the individual provenience and debitage data to be recorded are described in detail in order to permit coding into the database.

Please do not leave any fields blank. If a field does not apply to a certain artifact, put a dash (-) in that space. For example, if an artifact does not have a point-provenience, enter a dash (-) in the ProvN/Prov E and Depth fields. However, if a field has a list of selections to choose from, you **MUST** choose one of those selections. If you feel that there is not an appropriate selection for a particular artifact, see a lab supervisor about adding one.

CATALOG NUMBER: This is a number assigned to each artifact and its purpose is to make every data entry unique. Catalog numbers are tracked using the digital artifact inventory; please take care to avoid assigning duplicate catalog numbers.

SCAT NUMBER: This number indicates the catalog number of the bag of debitage where the sample came from. This is critical as it ties the sampled flake back to its original provenience

BOX NUMBER: Number of box where artifact is located. Always write the box number on the bag or envelope so that if the artifact is somehow separated from the collection it may be returned to its original box.

OUTBOX NUMBER: Number of outbox assigned to items sent for outside analysis. These boxes are temporary locations. When the item is returned it should be placed back in its original box.

SPECIMEN NUMBER: This number is assigned when an artifact is sent for outside analyses. If not applicable, enter “-“.

ANALYST'S INITIALS (AnInit): Put your initials here.

ANALYSIS DATE (AnDate): The date the analysis was done.

PROVENIENCE DATA

DISCOVERY NUMBER: Enter the discovery number that was assigned to the site. If no discovery number was assigned, enter a dash "-".

AGENCY NUMBER: CrNV-XX-XXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

STATE NUMBER: 26EkXXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

LOCUS: Enter the locus designation, if applicable.

CONCENTRATION NUMBER (Conc): Enter the concentration number, if applicable.

SHOT NUMBER: Shot number is typically only assigned for artifacts collected using a total station.

BACKHOE TRENCH NUMBER (BHTrench): Enter the backhoe trench number, if applicable.

AUGER TEST: If item was recovered from an auger test, put the number of the auger test from which the item was collected.

SHOVEL TEST: Designation of the shovel test unit, if applicable.

EXCAVATION/TEST UNIT (Ex/Test Unit): Enter the Excavation or Test Unit number, if applicable.

GRID: If the material was recovered from a feature or unit in one of the collection grids, put the grid designation here.

GRID N: This refers to the northing, or the north coordinate, of the southwest corner of the 1 m x 1 m **excavation unit.** The excavation grid coordinates are always justified to the southwest corner which is directly related to the primary collection grid datum which has been given the arbitrary Cartesian coordinates of 100 m north/100 m east. In other words, a unit with a grid north designation of 105 north is five meters north of the primary collection grid datum. Enter only integer values (do not add "N").

GRID E: This refers to the easting, or the east coordinate of the southwest corner of the 1 m x 1 m **excavation unit**. This is encoded just like a north coordinate (e.g., a unit with a grid east designation of 105 east is five meters east of the primary collection grid datum). Use only the integer value.

PROVENIENCE NORTHING/PROVENIENCE EASTING (PROVN/PROVE): Horizontal provenience of a point-provenienced specimen, measured to the nearest centimeter. Provenience will be expressed as meters north and east, i.e. N100.25/E99.35, but only the number needs to be

recorded (do not add “N” or “E”). Items collected with GPS units will typically have UTMs associated with them and they should be added to this field as well.

PROVENIENCE ELEVATION (PROV ELEV): Absolute elevation of a point-provenienced specimen, measured to the nearest centimeter relative to the local excavation datum. This field should only be used when PROVN/PROVE are used.

UNIT LEVEL: For excavation units: this refers to the arbitrary 10 cm levels numbered sequentially from the surface. Surface artifacts from excavation units are coded as level “0“. TElev and BElev are the top and bottom elevations of the level.

For surface collected artifacts in 1 x 1 m units within the grids: code as level “0” and put a dash in TElev and BElev. For artifacts collected from the surface throughout the site: code as level “0” and put a dash in TElev and BElev.

UNIT STRATUM: Enter the stratum designation, if applicable. Otherwise enter “-“. If you notice that an artifact from a particular site does not have a stratum entry, but all the others do, then take the time to find the correct data in the appropriate records.

FIELD SPECIMEN NUMBER: Enter the field specimen number.

ANCILLARY FIELD SPECIMEN NUMBER: Enter the field specimen number.

TELEV: The top elevation of the level in which the artifact was located is recorded for excavated artifacts.

BELEV: The bottom elevation of the level in which the artifact was located is recorded for excavated artifacts.

FEATURE NUMBER: Feature number, if artifact is from a feature. Otherwise enter “-“.

FEATURE PORTION: Horizontal provenience of the feature, e.g. N1/2 or NE1/4.

FEATURE LEVEL: this refers to the arbitrary 10 cm levels numbered sequentially from the origin (or truncated surface) of the feature.

FEATURE STRATUM: stratum designation assigned to feature depsosits.

<u>FLAKE DATA</u>

MATYP: Material type of specimen.

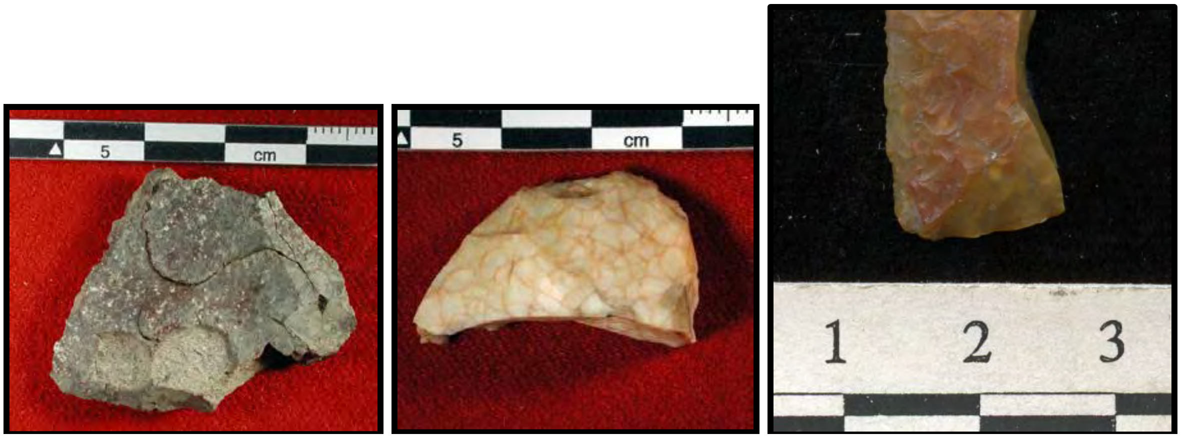
Chert
Fine-Grained Volcanic Rock (FGVR)
Obsidian
Quartzite
Other (specify your thoughts on material type in comments)
Indeterminate

COLOR: Enter the color using the simple color selections (below). Pick the dominant color (**closest match**) or in the case of variegated material choose that option.

Black
Gray
Red/Pink
Yellow
Orange
Green/Greenish Blue
Blue/Purple
Brown/Tan
White
Variegated: multi-colored rock with no clearly dominant color
Colorless/Translucent

THERMALT: This category includes those **chert** materials which have been intentionally and successfully heat treated and those that have been burned (intentionally or not). If the material is <u>not chert</u> enter as **Not Applicable**. Differential luster is the best evidence of heat treated items (usually a waxy luster fresh fracture surfaces with a matte luster on old scars). On occasion, color changes are evident (reddened exterior flaked surface with orange waxy interior flake scars). Crazing, spalling, the presence of pot lids, thermal fracturing, and/or a vitreous luster is present on burned items. There are examples of these features in the type collection. In the last 40 years numerous studies have investigated the changes that occur to stone during heat treatment (Bleed and Meier 1980; Buenger ; Patterson 1079; Purdy and Brooks 1971). Flintknappers have long recognized that heat treatment increases the "workability" of chert. Heat treatment tends to make the chert more brittle (Domanski and Webb 1992; Flenniken and Garrison 1975; Griffiths, et al. 1987; Rick 1978; Rick and Chappell 1983). The "level" of brittleness may be determined by certain temperature ranges obtained while heat treating (Speer 2010).

Thermally Altered/Burned. Includes those artifacts that exhibit crazing, spalling, pot lids, and/or vitreous luster. This category assumes it is unlikely that the object was deliberately heat treated.
Heat Treated. Includes those artifacts that exhibit differential luster. For example, this would include chert artifacts that exhibit waxy luster flake scars on matte surface. Examples are in the type collection. This category is defined to capture those artifacts that are deliberately heat treated.
None. **<u>Chert</u>** material with no indication of either thermal alteration or heat treatment.
Not Applicable. Includes all **<u>non-chert materials</u>**.



Fire Creek, Locus AC, burned flake with potlids and crazing (left). Fire Creek, Locus S, note intense crazing (middle). Hycroft biface (right) with heat treatment in the form of discoloration. Waxy orange flake scars intrude into and have removed the more matte reddened previous flake scars.

An example of differential luster. Right arrow indicates lustrous area, left arrow to non-lustrous area.

CONDITION: Condition of specimen in terms of completeness.

Complete. More than likely, analyzed flakes will be sampled only for complete specimens. Complete flakes are defined as those flakes that possess a recognizable platform, a single ventral surface and at least one lateral margin and a termination. If the flake is broken by a siret fracture and retains some of the platform (see illustration below), enter as complete. Note that with this definition it is possible to have flakes with radial breaks and perhaps deliberately broken flakes as long as they fall under the above definition of "complete flake".
Incomplete. Those flakes missing the platform. Errailure "flakes" would also be considered incomplete flakes. If you are analyzing a stratified sample of complete flakes this will not be an option.
Indeterminate. If we are stratifying the samples with complete flakes, this should not be used.

ULTRAVIOLET FLOURESCENCE AND LITHIC SOURCING

As geologists and mineralogists have long known, certain minerals fluoresce when stimulated by ultraviolet light (Raytech Industries 1965). Ultraviolet light (UV) is not visible to humans. UV interacts with atoms in the fluorescent material, transforming the energy in the electron shells of atoms and causing them to emit photons in the visible spectrum. The color or the fluorescence depends on the chemical composition of the mineral and, to a lesser extent, on the wave length of the UV radiation. Compared to daylight or ambient artificial light, the stimulated fluorescent light is faint and must be viewed in darkness.

The sources of toolstones can be distinguished by their behavior under UV light according to Hofman et al. (1991). Identifying chert toolstone sources and quantifying the frequencies of local and non-local cherts within lithic assemblages from the sites in the project area is an important aspect of the Lithic Terrane analysis. Hofman and his colleagues were able to distinguish Knife River Flint, Edwards Plateau Chert, and toolstone from the Alibates source in Paleoindian assemblages from the Great Plains. The same methods can be applied to analysis of all chert tools and projectile points recovered from the Long Canyon sites as well as control samples of toolstones from local and regional toolstone quarries.

A Raytech Model LS-88CB UV lamp that can be switched between long (3500 angstrom units) and short (2600 angstrom units) wavelength light, or can provide both simultaneously, is used as the ultraviolet light source. All specimens will be inspected in a completely darkened room after a few minutes of eye adjustment. Specimens will be examined under long and short wavelengths and both simultaneously.

UV LONG: For chert flakes. How does the item fluoresce under longwave UV light? Especially if a flake has inclusions, there may be areas that fluoresce differently. Code the most prominent color, and describe in Comments if other colors are present, also. You may also want to put other details in Comments, also, such as if the flake fluoresces very strong or very faintly. Wear goggles with UV protection when using the blacklight.

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

UV SHORT: For chert flakes. How does the item fluoresce under shortwave UV light? Especially if a flake has inclusions, there may be areas that fluoresce differently. Code the most prominent color, and describe in Comments if other colors are present, also. You may also want to put other details in Comments, also, such as if the flake fluoresces very strong or very faintly. Wear goggles with UV protection when using the blacklight.

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

CORTEX: Amount of cortex remaining on the dorsal surface of complete flakes. If the sample has been stratified to include only complete flakes, do not use the incomplete categories. If you are not sure if the surface is cortical see lab supervisor.

Absent. Complete tertiary flake.
Some Cortex (1 to 99%). Complete secondary flake.
All Cortex (100%). Complete primary flake.
Incomplete with Cortex. An incomplete flake fragment that retains any amount of cortex. Note, if the sample is stratified to only include complete flakes, you will not be using this category.
Incomplete without Cortex. An incomplete flake fragment that has no cortex. Note, if the sample is stratified to only include complete flakes, you will not be using this category.
Indeterminate. Use if you are unsure if the flake has cortex or not. Use this sparingly, especially if the sample is stratified with only complete flakes.

DOES THE FLAKE EXHIBIT A SIRET BREAK? (See below Figures): A siret "accident" break is identified by a longitudinal break which splits the flake (see Inizan, et al. 1999:34-35 and Figure 80; Tsirk 2010). Ordinarily these flakes are considered incomplete. However, for the purposes of our analyses we will consider these flakes complete as long as there is enough of the platform to obtain a measurement of platform angle. Make sure you have a definite platform remnant identified. If not, do not attempt to identify a siret break.

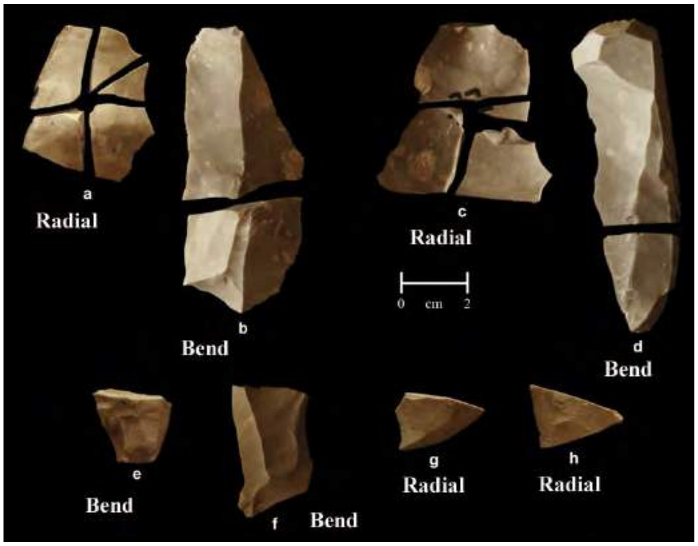
Yes. (should be entered as complete flake)
No.
Indeterminate. Use sparingly and only if it appears there is a possible siret break present.

An example of a siret break from Fire Creek.

DOES THE FLAKE EXHIBIT EVIDENCE FOR A RADIAL BREAK? (See below Figures): Radial breaks are caused by downward force such as a deliberate hammerstone strike or sometimes trampling or even knapping errors. Hammerstone strikes can leave traces of deliberate breakage (see intentional breakage diagram below). Lips are more of a characteristic of bending breaks produced during biface manufacture than deliberate radial breakage. A typical radial break will have two or more laterals with approximate 90 degree breaks (see below illustration). Jennings (2011) study found radial breaks produced during biface production are significantly thicker than those produced during intentional radial breakage of flakes. There are examples of radial breakage in the type collection.

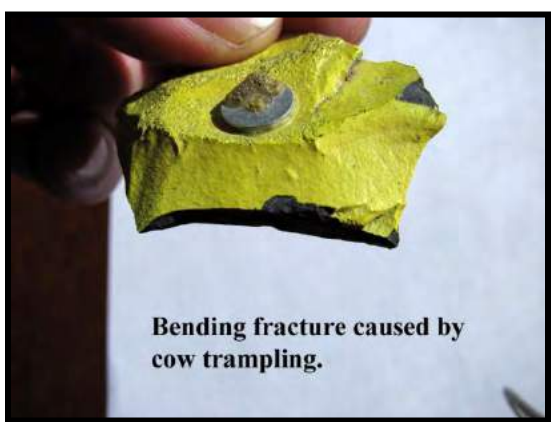
Yes. (as long as the platform is present this should be entered as complete flake)
No.

Indeterminate. Use sparingly.



a and b are the result of deliberate breakage, c and d trampling, and e-h were produced during biface manufacture (adopted from Jennings 2011:Figure 2).

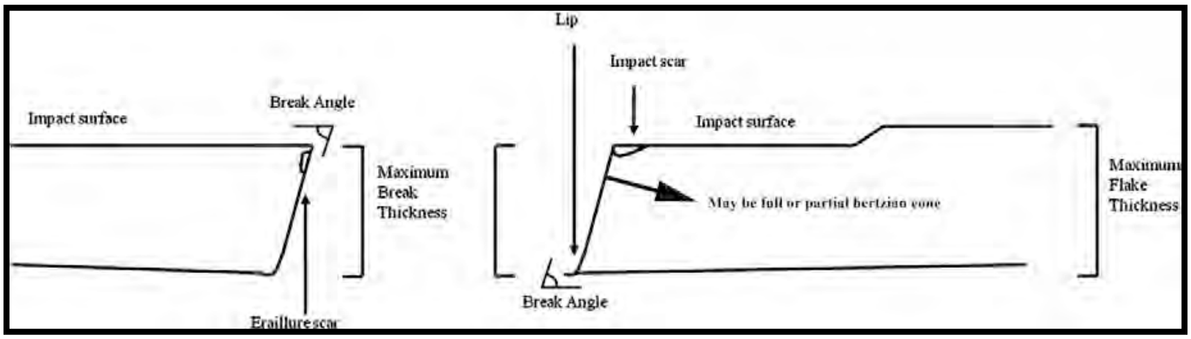
An example of biface broken by bending and radial fracture (adopted from Miller 2006:Figure 5.22) caused by thinning with a antler billet with poor support of the tool.



This bending fracture resulted from cow trampling. The fracture is close to 90 degrees with a distinct compression lip.

DOES THE FLAKE EXHIBIT EVIDENCE FOR INTENTIONAL BREAKAGE? Intentionally striking a flake with a hammerstone or billet can leave distinctive evidence in the form of subtle impact scars above the break, errailure scars on the break, partial Hertzian cones (bulb) on the break. Do not attempt on flakes smaller than approximately a quarter.

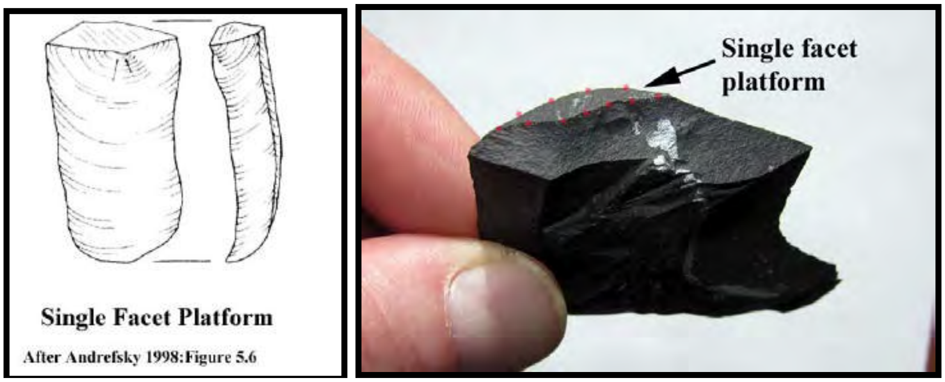
> **Yes.** (as long as the platform is present this should be entered as complete flake) Our macroscopic observations (hand lens ok) should include trying to identify presence/absence of an impact scar on the flake surface **at break**, a partial hertzian cone on the break surface, and/or an errailure scar on the break surface.
> **No.**
> **Indeterminate. Use sparingly.**



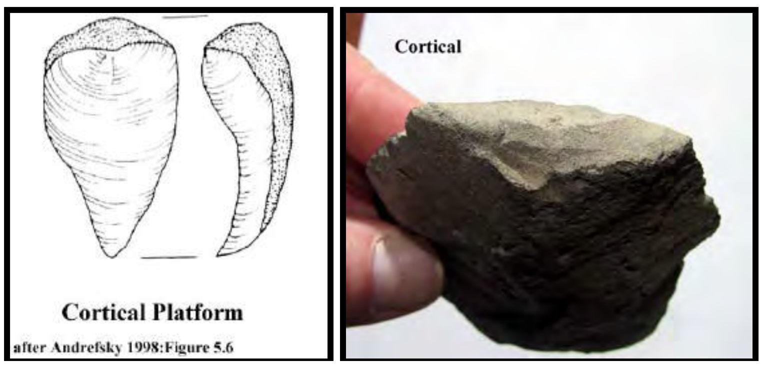
Some indications of direct flake breakage (from Jennings 2011:Figure 1).

PLATFORM TYPE: Enter the single most relevant descriptor below. Platform types are useful in determining a number of variables including percussor type and stage of reduction. Make sure that you are looking at a platform and not a facet caused by a compression break. Be suspicious of a "platform" that has compression curls. Look for hackles, compression rings, a bulb of percussion, and lip to locate the platform. If you are not sure ask a supervisor. Be cautious when the platform is crushed.

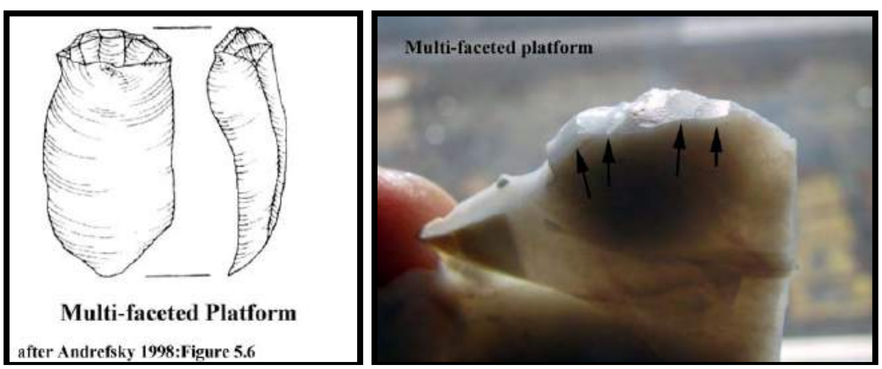
> **Absent.** (Should be entered as incomplete flake). Missing the platform. If we are stratifying the sample to only include complete flakes, then these should not be analyzed.
> **Single Facet Non-Cortical.** Exhibits a single flat surface as the striking platform.
> **Cortical.** Exhibits any amount of cortex on platform.
> **Multifaceted.** Displays two or more facets across the top of the platform.
> **Ground/Abraded.** Exhibits rounding, striations, or a facet formed from abrasion. You should observe a clear leveling of surface topography across most if not all of the platform surface. Platforms are generally ground to ensure a successful flake detachment.
> **Indeterminate.** Use sparingly. With stratified samples of complete flakes, you should not use indeterminate as a choice.



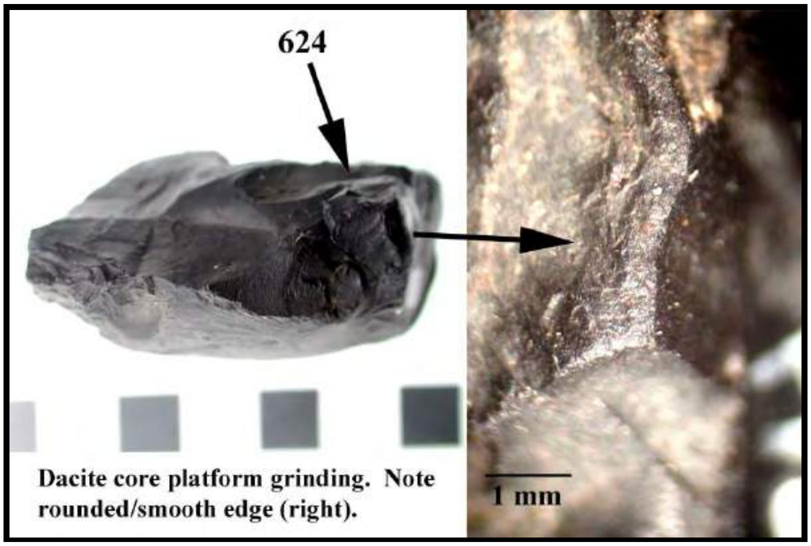
Examples of single facet platforms.



Examples of a cortical platform.



Examples of multifaceted platforms.

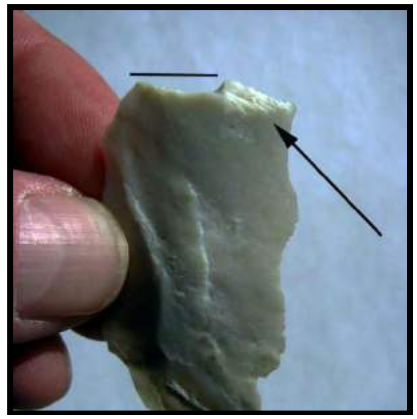


Platform grinding on a nearly spent core from the Robinson District, Nevada.

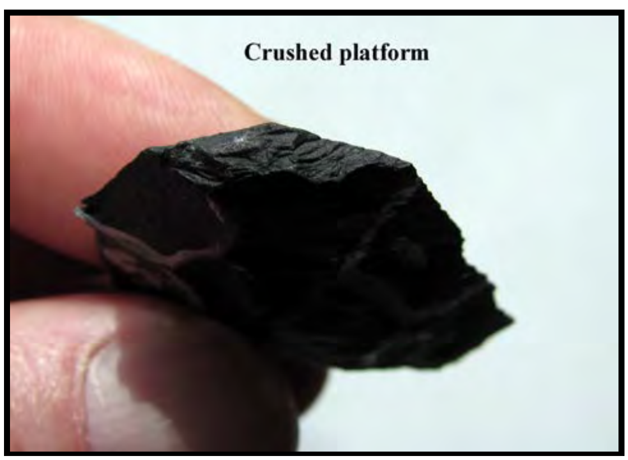
DOES THE PLATFORM SHOW EVIDENCE FOR CRUSHING/STEPPING? Surface looks like the edge of a battered hammerstone and may or may not have cascading steps off the dorsal edge or the platform itself has been largely removed from the impact with the percussor. Note that large scars on the dorsal face are likely the result of previous flake removals/attempts and not necessarily indicative of crushing.

Yes.
No.
Indeterminate. Use sparingly. With stratified samples of complete flakes you should not use indeterminate as a choice.

Cascading step flakes down the dorsal face of a hard hammer platform (after Cotterel and Kamminga 1987:Figure 9).



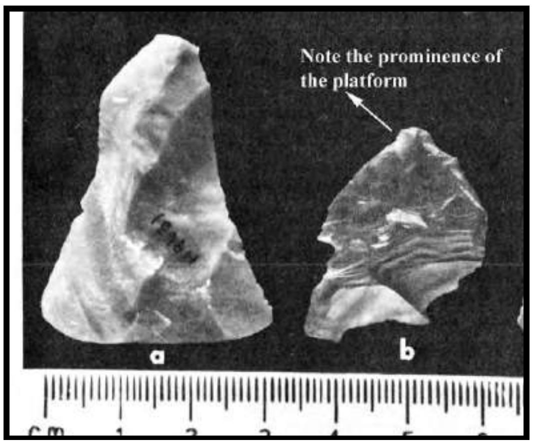
A close up view of cascading step fractures (photo to left) and both cascading steps and destroyed (missing) platform segment (photo to right). These are good indicators of hard hammer percussion.



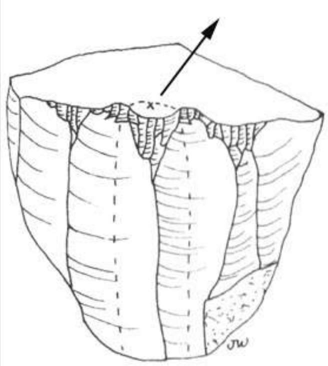
Another example of a crushed platform. Here the crushing is located directly on the facet.

IS THE PLATFORM ISOLATED? This refers to the “prominence” of the flake platform. In part it has to do with the deliberate selection of appropriate platforms for percussion flaking. But, platform isolation can also be carefully done with essentially large trimming flakes removed from the dorsal face of the flake at the proximal end. This type of platform isolation will generally consist of the removal of one or more flakes on either side of platform. In some cases isolation flakes may be removed on only one side of the platform. Platform isolation is done to both increase the chances of hitting the platform and also serves to concentrate the force and ensure a more successful flake detachment. In pressure flaking, platforms are isolated by the removal of flakes on both sides of the intended platform on one face. The pressure flake is then removed from the opposite face (see below illustration). These platforms are identifiable by their prominence from the lateral margin.

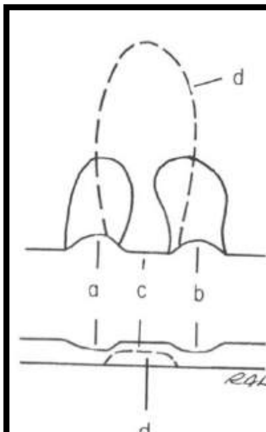
Yes.
No.
Indeterminate. Use sparingly. With stratified samples of complete flakes, indeterminate should not be used as a choice.



Note that the flake labeled “a” was isolated by prior removal of dorsal flake scars to align the ridge (after Frison and Bradley 1980:Figure 16). The platform of the overshot Levallois flake on the right was isolated by prior removal of two dorsal flakes which aligned the dorsal ridge back to the platform.



Trimming flakes isolating the core platform (still ridge struck) after Whittaker 1994:Figure 6.23.



a and b are the pressure isolation flakes removed prior to detachment of objective flake (d) from the oppposing face using platform (c) (after Whittaker 1994:Figure 7.19

Trimming flakes isolating (and strengthening) the platform for a hammerstone strike (left) and deliberate isolation during pressure flaking (right).

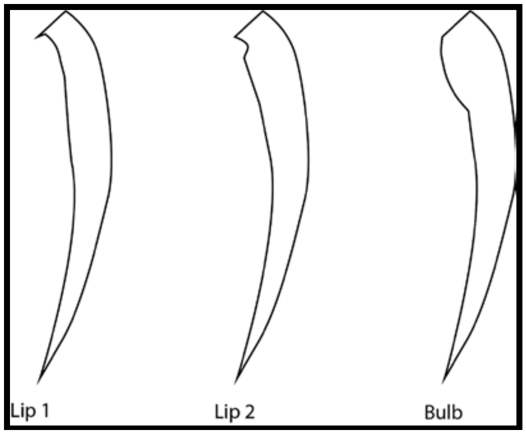
IS THE PLATFORM SITUATED ON A RIDGE? If a dorsal arris ridge runs up and touches any part of the platform, it is situated on a ridge. If the ridge has been truncated by trimming flakes and almost touches the platform it is still entered as "Yes". Ridge struck flakes often, but not always have a characteristic "gull wing" shape (see illustrations below and type collections).

Yes.
No.
Indeterminate. With stratified samples of complete flakes, indeterminate should not be selected as a choice.

Characteristics of ridge struck flakes.

LIP: Inspect the ventral side of the platform for presence or absence of a lip. A lip is a small projection or overhang at the base of the platform. Platform lips are often linked to soft hammer percussion. The following sequence for coding lips is from Schindler and Kock (2012).

Absent. Flake lacks a platform and lip. If the sample is stratified to include only complete flakes, then this should not be used. Flakes missing platforms are considered incomplete.
Lip 1. Drag your fingernail across the ventral face towards the platform. If your fingernail snags the platform, STOP AND ENTER as Lip 1.
Lip 2. If your fingernail does not snag, then view the flake in cross-section. If the platform extends over the ventral flake surface and/or a concavity is present just below the platform (however slight), enter as Lip 2.
No. If the flake failed both lip tests (but has a platform and bulb), Enter as No.



Lip coding (taken from Schindler and Kock 2012: Figure 1).

BULB OF PERCUSSION: Directly below the striking platform on conchoidal flakes, there may be a raised hump on the ventral surface. This is known as the bulb of applied force and may be large and prominent or diffuse and difficult to recognize (Andrefsky 1998:Figure 2.7). The distinctions between prominent and diffuse are relative and subjective. There are examples of prominent and diffuse bulbs in the teaching collection. See the lab director/supervisor if you are unsure. Note that relative bulb size can be measured by comparing the flake thickness at the bulb to flake thickness at the mid-point of the flake. Simply subtract the bulb thickness from the thickness at mid-point for a measure of relative bulb size (see Andrefsky 1998:Table 6.2).

The size of the bulb of percussion may provide an indication of the type of percussor (e.g., hard, soft) used to remove the flake from the core. It may also be related to the angle of applied force as well as other variables. Diffuse bulbs have been called soft-hammer percussion flakes by some researchers (Donald E. Crabtree 1972:74; Frison 1968:149). Others (Tsirk 1979) have demonstrated, via brittle fracture studies, that flakes with diffuse or no bulbs and pronounced lips are a result of bending forces. In many cases, these are the result of soft hammers or percussors (i.e. soft wood or sandstone hammerstone).

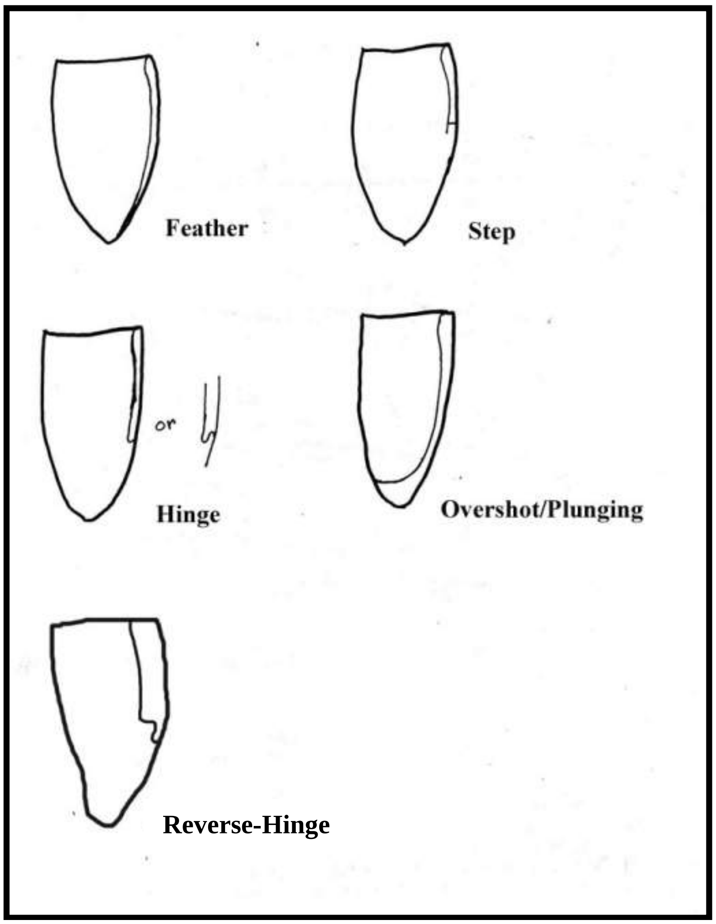
> **Absent.** The area where a bulb would exist is not present. If the sample is stratified to include only complete flakes, then this should not be used. Must be entered as incomplete flake.
> **Prominent.**
> **Diffuse.**
> **Indeterminate.** With stratified samples of complete flakes, indeterminate should not be selected.

TERMINATION: Nature of the distal end of the flake (fracture termination). Flake terminations tell us about the kinds of forces used to detach the piece. Choose the best fit as illustrated below. In the event that multiple types are present, choose the one that encompasses the majority of the termination.

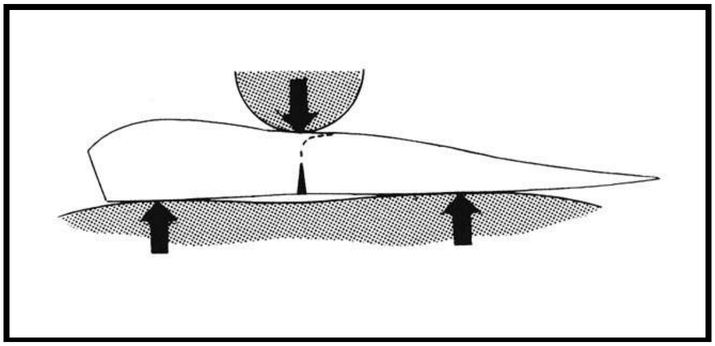
> **Feather.** (see figure below)
> **Hinge/Step or Reverse Hinge.** (see figures below)
> **Outrepassé.** Also known as overshot or plunging termination. (see figure below). Make sure you evaluate the compression rings to make sure that the flake is not an "edge bite" flake.
> **Material Flaw.** Evidence may be in the form of termination at a vesicle or inclusion or point of drastic change in material quality (see figure below**).**
> **Multiple Steps.** On occasion, the termination may exhibit multiple step fractures that intersect, producing a polygonal, "serrated," or ""denticulate" edge (though not purposefully created). It is unclear how this termination type is produced, possibly from edge failure during use or from

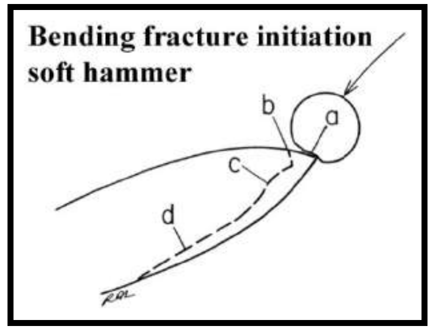
post-depositional damage. This termination type was common in the Round Mountain assemblage.
Indeterminate. With stratified samples of complete flakes, indeterminate should not be selected.

For the purposes of this analyses hinge, step and reverse hinge fractures are combined as on entity. **Reverse-Hinge:** Reverse-hinge fractures will typically have a lip or “compression curl” (see below illustrations) to distinguish from hinge. A non-conchoidal fracture caused by flexing that exceeds the elasticity of the material. The fracture is characterized by the lack of a bulb of force, fracture initiation near the center of an artifact’s face rather than at the margin, and fracture plane propagation oriented nearly perpendicular to the initiation face. The fracture exhibits compression rings, radial striations, and often a distinctive finial termination. Reverse-hinge fractures occur during stone tool manufacture as a result of percussive shock waves (end shock) or from bending thin items in the hand during pressure flaking, during stone tool use such as from impact on projectile points, and from post-depositional effects like trampling. (see figure below).

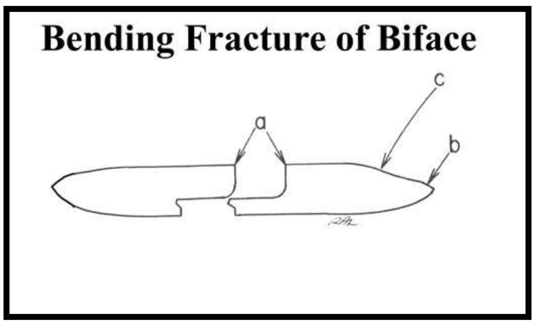


Termination types (after Tsirk 1997)

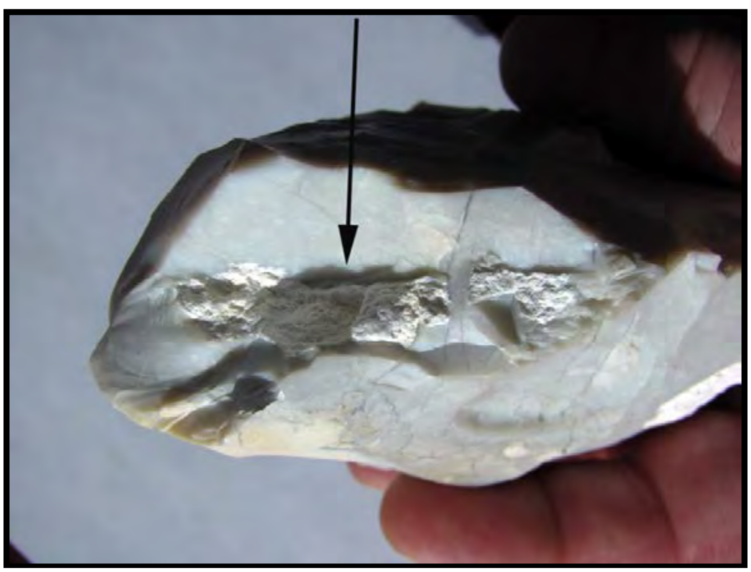




Left, forces that can result in "reverse-hinge terminations" (After Cotterell and Kamminga 1987:Figure 4). Right, soft hammer compression at platform causing the initiation of a bending fracture (b) formation of a slight bulb (c) and crack (d) (after Whittaker 1995:Figure 8.10).



Left image is an illustrated example of reverse-hinge fracture (a) in a biface. The blow should have struck at point (b) but instead was too far into the tool at point (c) (after Whittaker 1995:Figure 8.12). Reverse-hinge terminations will exhibit a compression curl as illustrated at right (modified from Quinn 2006:Figure 4.10 (d)).



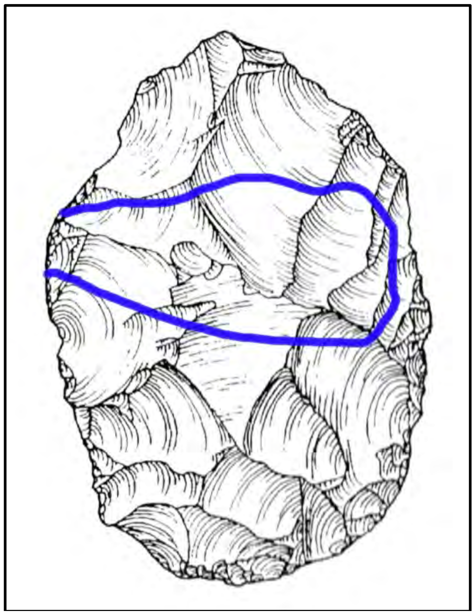
"Impurities" in this Tosawihi Chert caused the step fracture.

Examples of "Multiple-Steps" termination type on several flakes from RMGC-DAT.

NUMBER OF DORSAL SCARS: Excluding obvious platform preparatory flakes and flakes less than 2 mm in length, how many dorsal flake scars are present? Enter 0 if none are present.

PRESENCE OF OPPOSING SCARS: Are there one or more flake scars present that originate from both the proximal and distal ends of the flake (see illustration). Note flakes may also originate from opposing lateral margins or in between lateral margins and distal and proximal?

- **Yes**
- **No**
- **Indeterminate** (use sparingly)

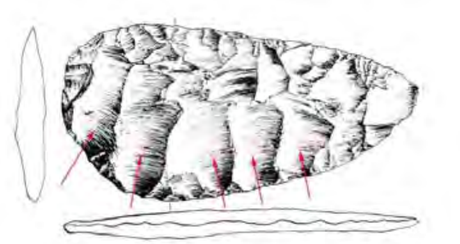


Blue line shows hypothetical outline of flake detachment and presence of opposing scars (after Andrefsky 1998:Figure 7.17)

FLAKE TYPE: Select the appropriate technological flake type, based on its recorded attributes. Use "Indeterminate Technological Type" if the flake does not match any of the below categories. There are examples of these types in the type collection.

> **Edge Trimming Flake.** These are frequent at the location of flintknapping. Small percussion flake (NOT PRESSURE) that we assume was produced during edge trimming/platform preparation (strengthening of the core/biface edge) while making a tool. If the flake has all of the attributes of a biface thinning flake please enter as a biface thinning flake, otherwise use this category.

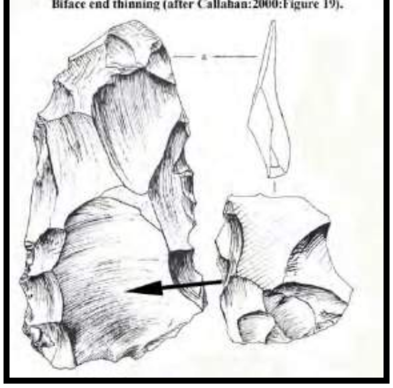
> **Biface Thinning Flake.** These flakes are usually percussion produced while trimming, shaping, and/or thinning a bifacial tool. Often they are produced by soft hammers. They vary in size from small to quite large but are typically thin. They will have characteristic flake scars on the dorsal face (from previous flake removals while shaping the bifacial tool). Platforms are typically smaller and narrower than "core reduction flakes. The platforms are generally faceted and/or rounded from abrasion/grinding. The flakes are typically curved in longitudinal cross section. The lateral and distal edge angles are acute with feathered termination and little or no cortex. The bulb of percussion is typically diffuse and in general platform "lips" are more common and parallel flake scars originating from the opposite bifacial margin may be present (Andrefsky 1998::118 and Figure 116.112; Frison 1968::149-150; Whittaker 1995:185-187). There are numerous examples in the type collection.



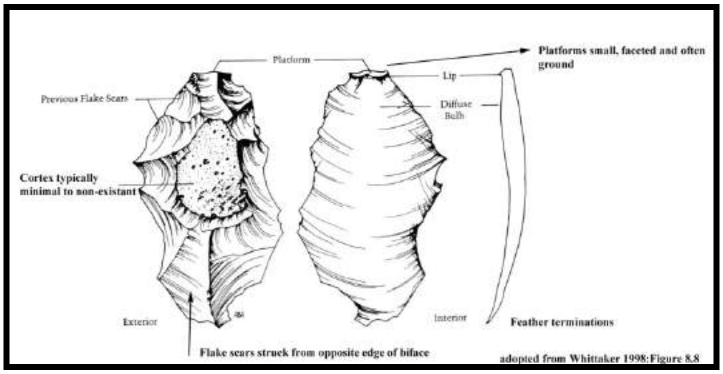
Examples of large biface thinning flakes (adopted from Callahan 2000:Figure 54).

Examples of large thinning flakes removed from a Stage 4 biface (adopted from Callahan 2000:Figure 54).

Biface end thinning (after Callahan:2000:Figure 19).



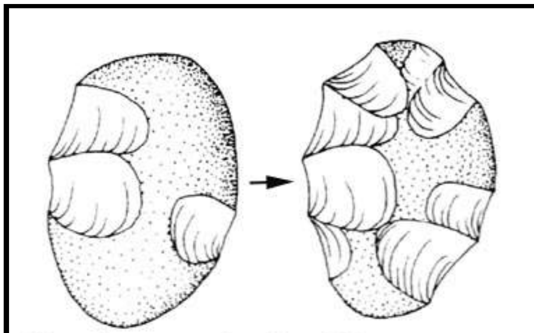
Example of biface end thinning flake (left) (after Callahan 2000:Figure 19) and experimental early stage dacite biface thinning flakes and biface (right).



Features of biface thinning flakes (after Whittaker 1995:Figure 8.8).

Above are experimental later stage biface thinning flakes and biface.

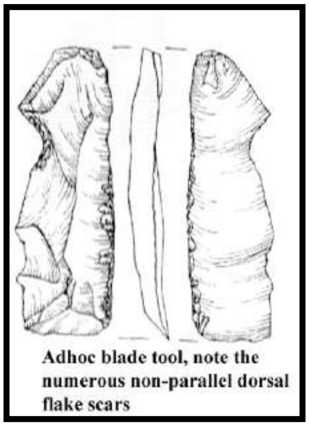
Core Reduction Flake. These flakes are indicative of general percussion core reduction and vary drastically according to raw material and intended product. They typically are identified by their wide, single faceted, sometimes cortical platforms. Exterior platform angles are much larger (up to 90 degrees) than biface thinning flakes. Cortex is often present on the dorsal face and dorsal flake scars are generally not as abundant or patterned as bifacial trajectory flakes. Longitudinal cross sections are straight to slightly curved.

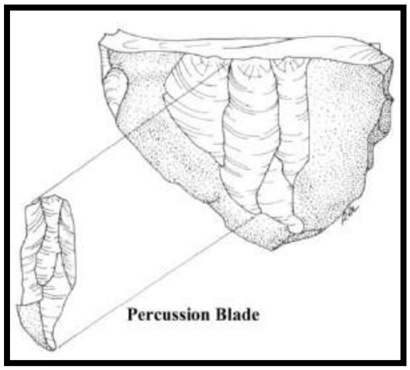


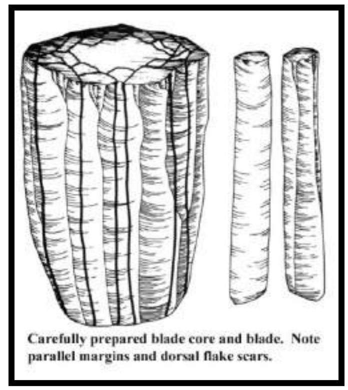
Generic core reduction flakes (after Andrefsky 1998:Figure 7.11)

Blade-like Flake or "Adhoc Blade". Defined as a flake with length = 2 or more times the width but not part of formal blade making technique. At Fire Creek these are generally "adhoc blades" removed via percussion from unprepared or expediently prepared cores which present "fortuitous" edges for blade removal. These blades are not removed in a systematic manner. An adhoc percussion blade is contrasted with carefully prepared blade removal in the below illustrations. Note that blade-like flakes often have perpendicular or oblique flake scars on their dorsal faces which result in irregular margins (Eren, et al. 2011).

Prismatic/Trapezoidal Blade (percussion or pressure). These blades (length = 2X width) are part of a systematic removal from a core. This category includes both systematic removal of blades along a core edge and carefully prepared blade cores (see below illustrations). Blade margins are parallel as are the dorsal arris ridges (flake scars).



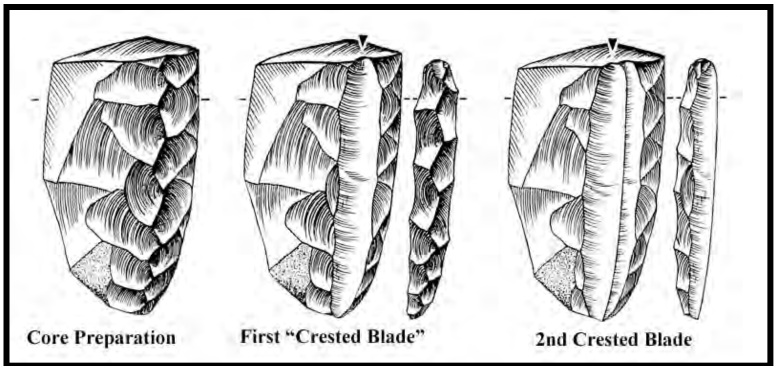




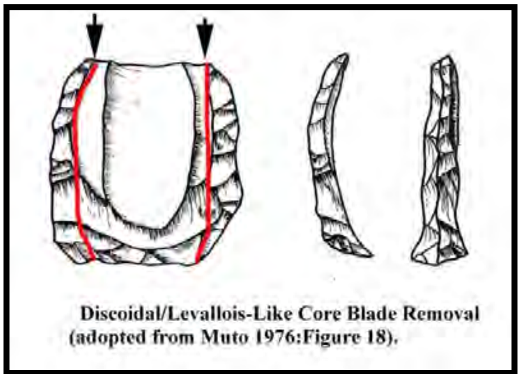
An adhoc blade (left) (adopted from Andrefsky 1998:Figure 7.23), a percussion blade and core (middle) (adopted from Whittaker 1995:Figure 9.9), and a carefully prepared prismatic blade core and trapezoidal cross section blades (right) (adopted from Whittaker 1995:Figure 3.19).

Comparison of prismatic blades made by pressure (left) and percussion (right) (After Don E. Crabtree 1968:Figure 7). Both of these should be considered formal prismatic/trapezoidal blades.

Crested Blade. Typically the first blade removed from a core. The characteristic feature is bi-directional flake scars on the dorsal surface (see illustration below). Similar blades can be produced from discoidal/Levallois like cores (see illustration below). Some of the subsequent blades might only have unidirectional scars. They are still entered as “crested blades”. If the blade does not quite fit the definition (length=2x width) still enter as crested blade.



Examples of blade core preparation and removal of "crested blades" (adopted from Inizan, et al. 1999:Figure 61).

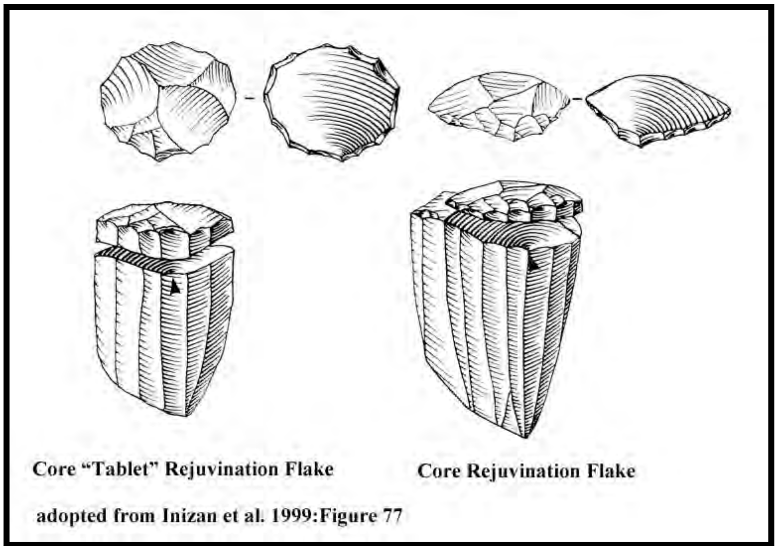


Removal of Discoidal/Levallois like "corner blades" (Muto 1976) will be entered as "crested".

Side Struck Flake. These are defined as any flake with a width equal to or more than two times the length. At Fire Creek these flakes appeared to have been a deliberately produced "blank" for certain tool types.

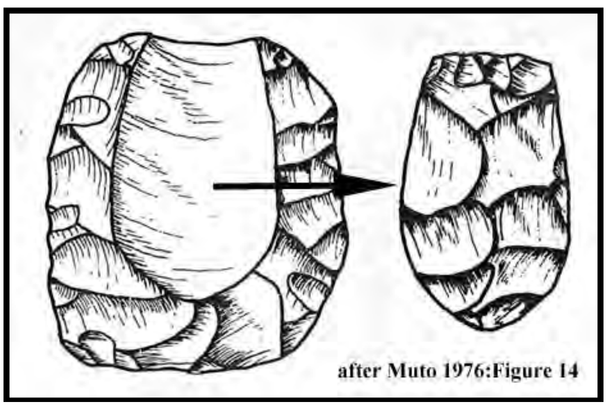
Biface or Generic Outrepassé Flake. A flake whose distal termination bends inward and removes a portion of the opposing face of the core or tool (see termination illustration). Ordinarily these are analyzed as flakes. However, as they frequently are incomplete and would have therefore been removed from analytical consideration, we opted to include all biface overshot flakes (and edge bite flakes) in the tool analysis.

Core Platform Rejuvenation or "Tablet" Flake. This is a very specialized flake that re-establishes a platform on a core (see below).



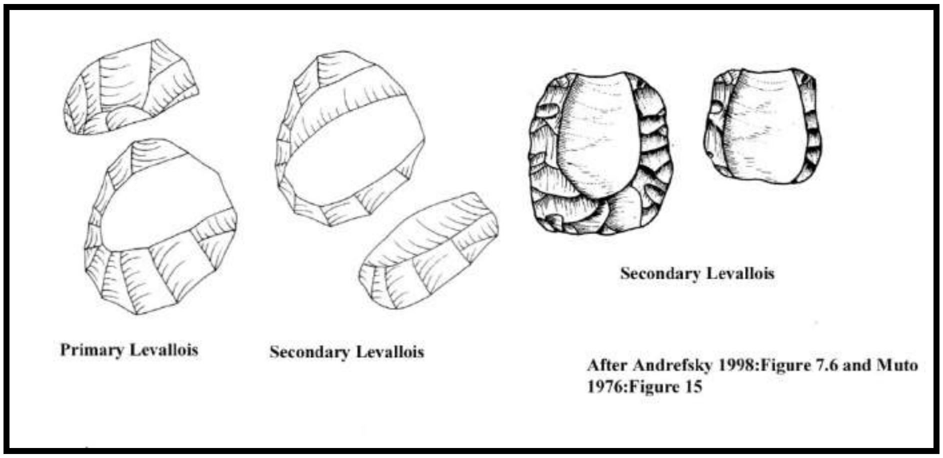
The removal of a core tablet rejuvenation flake (after Inizan, et al. 1999:Figure 77). See our type collection for an example.

Initial Levallois-like Flake. This is a specialized flake removed from a discoidal or Levallois-like core (Boëda 1995; Dibble and Bar-Yosef 1995; Muto 1976; Sandgathe 2005; Van Peer 1992). Levallois-like cores are prepared with a slightly convex upper surface. The Levallois-like flake is percussion struck from generally a carefully prepared (isolated platform). Perpendicular flake scars are common on the dorsal face (see illustration below for general concept).



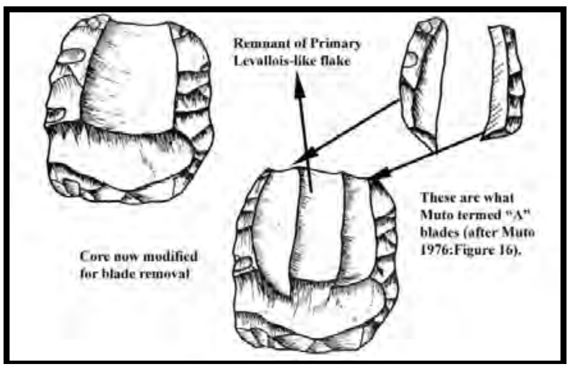
Removal of Primary Levallois Flake (after Muto 1976:Figure 14).

Secondary Levallois-like Flake. These flakes reveal evidence for an earlier Levallois flake detachment including the primary Levallois flake detachment and/or perpendicular core shaping flakes (see below illustrations). They would include Muto's "A" blades as well as a simple secondary Levallois flake.



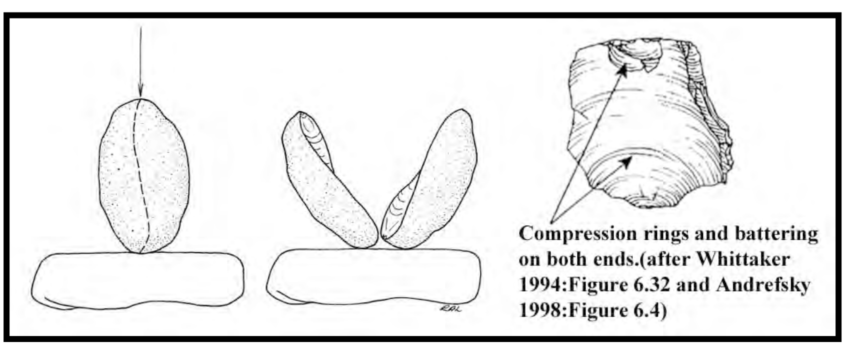
Removal of secondary Levallois-like flakes will exhibit evidence for primary removal as well as the centripetal flaking pattern of the core (after Andrefsky 1998:Figure 7.6; after Muto 1976:Figure 15).

"A" Blade. Associated with the Levallois-like technique found at Fire Creek, these blade flakes are removed along the ridges left by primary flake removals. Their removal provides additional ridges on the core for blade making (Muto 1976 and Nisbet 1981).



"A" blades removed from a Levallois-like core (after Muto 1976:Figure 16).

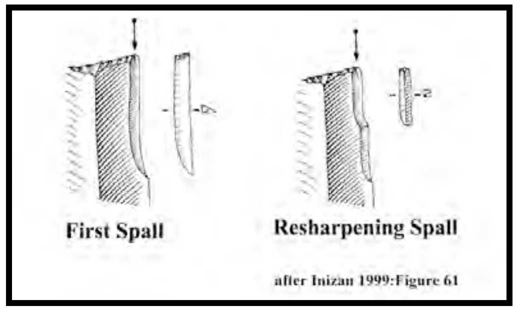
Bipolar Flake or Blade (citrus flake, tangerine flake). These flakes originated from direct percussion of an objective piece on top of an anvil. There is a lot of variability in the morphology of bipolar debris. The flakes have been referred to as citrus or tangerine flakes as sometimes they resemble these shapes with their very curved exterior. However, when a piece exhibits battering/crushing on opposing ends and/or compression rings (not bulbs) on the ventral surface at both ends then the flake should be classified as bipolar (see illustrations below).

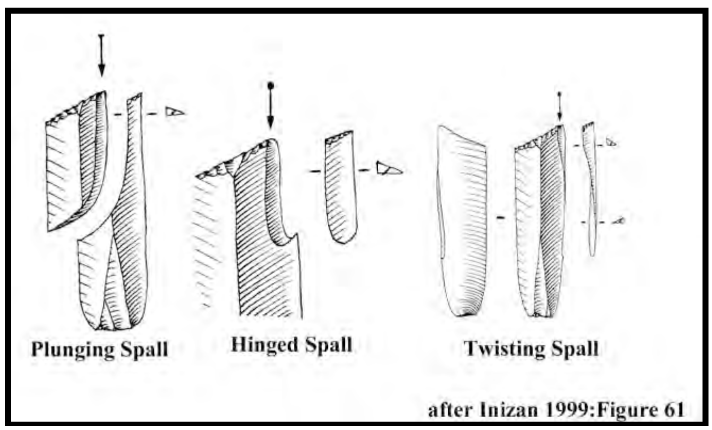


The Bipolar reduction strategy often leaves distinct traces (after Andrefsky 1998:Figure 6.4; after Whittaker 1995:Figure 6.22).

Hammerstone Spall. A flake with a dorsal surface and/or platform having evidence for use as a hammerstone. Evidence includes impact damage---crushed edges, pitting, fracturing, and spalling. These flakes will tend to lack obvious striking platforms and have a very acute intersection between the ventral and dorsal impact surfaces (Mobley 1982:96).

Burin Spall. These are small flakes that are struck off of burins during their manufacture. They can assume several forms several of which are illustrated below.



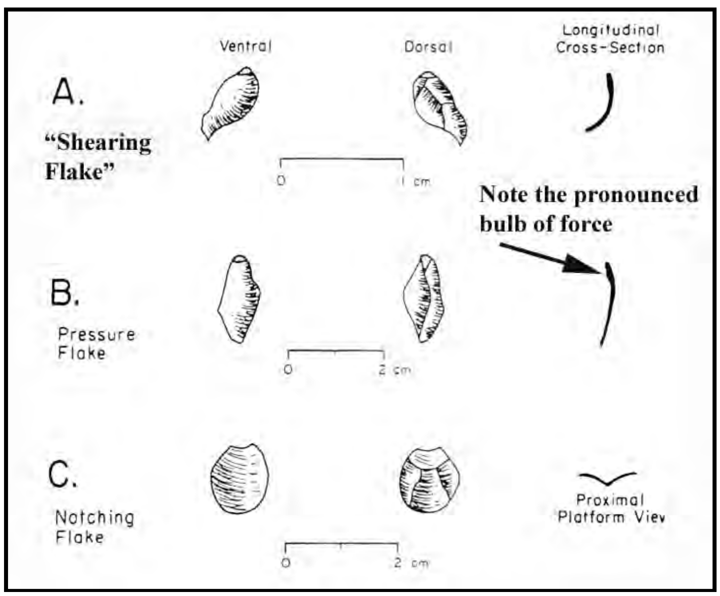


There are many forms of burins and spalls (after Inizan, et al. 1999:Figure 61).

Eraillure Flake. Small "flakes" that pop off of the bulb of percussion during flaking. They often have feather terminations on all edges and will not have a platform. Examples are in the type collection.

Large eraillure flake.

Pressure Flake. These flakes are generally small and are formed by the use of pressure flakers exerting a down and inward force on the tool edge. Typically they are defined by faceted platforms and well defined bulbs of force (Towner and Warburton 1990). These flakes generally are removed in the final stages of tool manufacture. Often the platforms are prepared by abrasion to both form the correct angle and to keep the pressure flaker tip from sliding off too easily. See below illustration.



Attributes of shearing flakes, pressure flakes and notching flakes (after Towner and Warburton 1990:Figure 4).

Notching Flake. Producing notches in bifaces/projectile points can produce very distinctive flakes. The knapper uses pressure to move straight in removing a couple of flakes and then turns the piece over and repeats the process utilizing the negative scar as the platform. These flakes are generally lunate and are round and expanding in plan view. They are typically very small with pronounced "V" shaped platforms (see figure below) (Abrams 1984; Austin 1986; Titmus 1985; Towner and Warburton 1990).

Channel/Flute Flake. These flakes are produced by removing the medial section of projectile points (Clovis/Folsom) from the base at both sides. They are thought to facilitate hafting.

A conjoining broken flute flake and Folsom point base from Blackwater Draw (after Boldurian, et al. 1987:Figure 4).

Edge Bite Flake. These flakes are a unique type of biface thinning flake. The edge bite flake is the result of a poor strike on the edge of a biface that results in the removal of a significant and readily identifiable tool edge fragment. The flake typically looks like an overshot flake, but the major difference is the force point and compression rings will indicate that the force came from the side with the edge fragment. A picture of an edge bite flake is below. Note how the compression lines indicate that the force came from the side with the large edge fragment. These flakes are associated with a very poorly delivered strike and thus can be indicators of skill level. They are typically analyzed as flakes, however as they are often thought to be "incomplete" flakes, we opted to include all overshot and edge bite flakes in tool analysis.

An example of an edge bite flake.

Indeterminate Technological Flake. This category is for flakes that cannot be placed in any of the above technological types.

Is the Flake an Error Recovery Flake? This is any flake which possesses a distinctive, deep hinge(s) and/or step fracture(s) on the dorsal face. The intent of the flintknapper was to remove the step or hinge fracture so that knapping could progress on the tool (see illustration below).

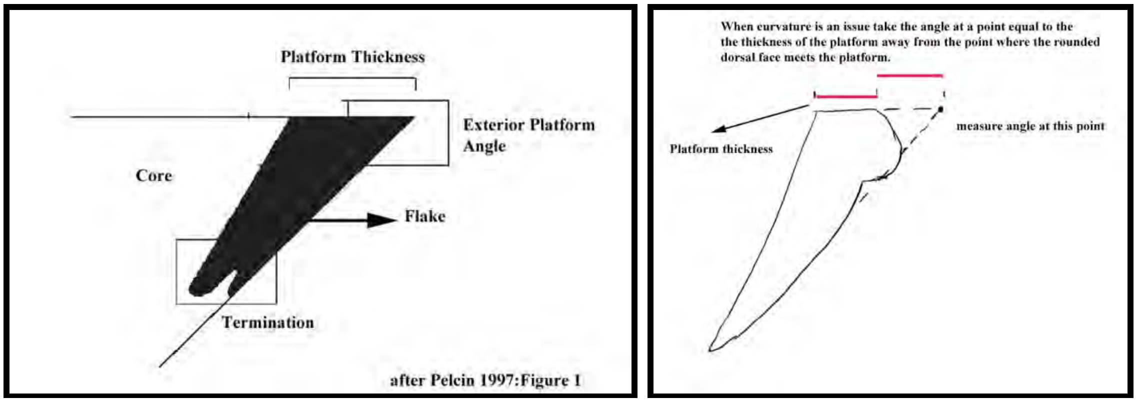
Yes.
No.

An example of an error recovery flake in WCRM teaching collection. Here the flake was struck hard enough and on a large platform to "go under" and remove the step flake. Often such flakes will originate from the opposite direction to remove the step.

DIMENSIONS/METRICS

Dimensions are measured to the nearest tenth of a millimeter (0.1 mm), and the nearest hundredth of a gram (0.01 g).

EXTERIOR PLATFORM ANGLE: The angle of the platform relative to the **dorsal** surface of the flake (Pelcin 1997:Figure 1), **measured to the nearest 1 degree increment** using a goniometer. Locate an area that best characterizes the angle and then take the measurement. Making an estimation to the closest degree. If the measurement is not possible or too difficult due to the flake morphology try to have a lab supervisor make the measurement with the microscope. If the measurement cannot be made then write a dash "-". Please use this category sparingly and after consultation with lab supervisor. However, if the measurement is not possible only due to a rounded or recessed morphology at the point where the dorsal face meets the platform then incorporate the method used by Dibble (1989:153) "on flakes with curved exterior surfaces, the measurement of this angle can vary depending on the point on the exterior surface at which the measure was taken. For the sake of consistency, the angle used was that formed by two lines -- one represented by the platform thickness, the other extending down the exterior face directly in line with the axis of percussion to a distance equal to the platform thickness." This is illustrated below. Please only apply this to those flakes that have a curvature issue. If there is a true angle---measure the angle. Please see a supervisor if you have any questions. IF YOU ARE RECORDING ANGLES THAT ARE OVER 95 DEGREES THEN YOU ARE LIKELY DOING THIS WRONG. BE CAREFUL WITH MULTIFACETED PLATFORMS. IF YOU DO NOT THINK THE ANGLE IS INDICATIVE OF WHAT HAPPENED DUE TO CRUSHING, PLATFORM MODIFICATION ETC. THEN DO NOT RECORD THE ANGLE.



The above are illustrations of how to measure platform angle and thickness.

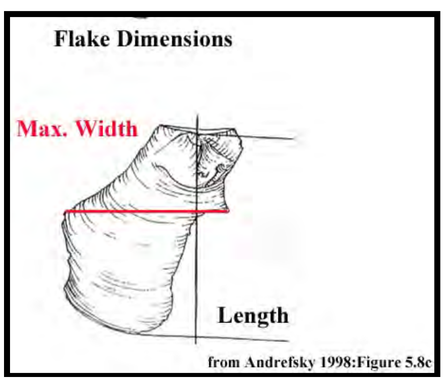
PLATFORM THICKNESS (to 0.1 mm): Please enter the maximum dimension of the platform from ventral to dorsal surface using only digital calipers. Note that this is not the platform length. If measurement is not possible/not applicable simply write a dash "-".

WEIGHT (to 0.01 g): Weight of the specimen to the nearest 0.01 of a gram. If the weight is less than 0.01 grams, enter 0.01 grams as the weight and specify "less than 0.01 grams" in comments.

LENGTH (to 0.1 mm): The maximum flake length measured as a line perpendicular from the platform to the most remote point on the distal end (Andrefsky 1998:Figure 5.8c). If the flake is fragmentary and the longitudinal axis cannot be determined from the presence of a platform, ripple marks, etc, then record the maximum dimension. Even incomplete flakes are measured.

WIDTH (to 0.1 mm): The maximum distance from edge to edge perpendicular to, and in the same plane as length (see illustration below).

THICKNESS (to 0.1 mm): The maximum dimension at right angles to the plane in which length and width were measured **at the point of inflexion** (where the bulb ends and the ventral surface of the flake begins). If there is no bulb of force, or its existence is indeterminate, measure the thickest part of the flake.



COMMENTS: All important characteristics that are not specifically entered should be described here along with any observations you feel are important. Suggestions include recording the presence of ring cracks, radial fissures, Hertzian cones, use wear on a platform indicating that the flake was originally part of a utilized tool, etc.

REFERENCES CITED

Abrams, Elliot M.
1984 Replicative Experimentation at Copan, Honduras: Implications for Ancient Economic Specialization. *Journal of New World Archaeology* 6(2):39-48.

Andrefsky, Jr., William
1998 *Lithics: Macroscopic Approaches to Analysis*. Cambridge University Press, Cambridge.

Austin, R.J.
1986 The Experimental Reproduction and Archaeological Occurrence of Biface Notching Flakes. *Lithic Technology* 15:96-100.

Bleed, Peter and Marlene Meier
1980 An Objective Test of the Effects of Heat Treatment of Flakeable Stone. *American Antiquity* 45(3):502-507.

Boëda, Eric
1995 Levallois: A Volumetric Construction, Methods, A Technique. In *The Definition and Interpretation of Levallois Technology*, edited by H. L. Dibble and O. Bar-Yosef, pp. 41-68. Prehistory Press, Madison.

Boldurian, Anthony T., George A. Agogino, Phillip H. Shelley and Mark Slaughter
1987 FOLSOM BIFACE MANUFACTURE, RETOOLING, AND SITE FUNCTION AT THE MITCHELL LOCALITY OF BLACKWATER DRAW. *The Plains Anthropologist* 32(117):299-311.

Buenger, Brent A.
The impact of wildland and prescribed fire on archaeological resources, Anthropology, University of Kansas, Lawrence.

Button, Van Tries
1989 The Byrd Mountain Lithic Cache (34GR149), A Find of Edwards Chert from Greer County, Southwestern Oklahoma. *Bulletin of the Texas Archaeological Society* 60:209-216.

Callahan, Errett
2000 *The Basics of Biface Knapping in the Eastern Fluted Point Tradition*. fourth ed. Piltdown Productions, Lynchburg.

Cotterell, Brian and Johan Kamminga
1987 The Formation of Flakes. *American Antiquity* 52:675-708.

Crabtree, Don E.
1968 Mesoamerican Polyhedral Cores and Prismatic Blades. *American Antiquity* 33(4):446-478.

Crabtree, Donald E.
1972 *An Introduction to Flintworking*. Occasional Papers of the Idaho State University Museum Number 28. Idaho State University Museum, Pocatello.

Dibble, Harold L. and Ofer Bar-Yosef (editors)
1995 *The Definition and Interpretation of Levallois Technology*. Prehistory Press, Madison.

Domanski, Marian and John A. Webb
1992 Effect of Heat Treatment on Siliceous Rocks Used in Prehistoric Lithic Technology. *Journal and Archaeological Science* 19:601-614.

Eren, Metin I., Stanley Vanderlaan and John D. Holland
2011 Overshot Flaking at the Arc Site, Genesee County, New York: Examining the Clovis-Gainey Connection. *The Open Anthropology Journal* 4:40-52.

Flenniken, J. Jeffrey and Ervan G. Garrison
1975 Thermally Altered Novaculite and Stone Tool Manufacturing Techniques. *Journal of Field Archaeology* 2(1/2):125-131.

Frison, George C.
1968 A Functional Analysis of Certain Chipped Stone Tools. *American Antiquity* 33(2):149-155.

Frison, George C. and Bruce A. Bradley
1980 *Folsom Tools and Technology at the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque.

Griffiths, D.R., C.A. Bergman, C.J. Clayton, K. Ohnuma, G.V. Robins and N.J. Seeley
1987 Experimental Investigation of the Heat Treatment of Flint. In *The Human Uses of Flint and Chert, Proceedings of the Fourth International Flint Symposium Held at Brighton Polytechnic 10-15 April 1983*, edited by G. d. G. Sieveking and M. H. Newcomer, pp. 44-52. University of Cambridge Press, Cambridge.

Hofman, Jack L., Lawrence C. Todd and Michael B. Collins
1991 Identification of Central Texas Edwards Chert at the Folsom and Lindenmeier Sites. *Plains Anthropologist* 36(137):197-308.

Industries, Raytech
1965 *The Story of Fluorescence*. Raytech Industries, Stafford Springs, Connecticut.

Inizan, Marie-Louise, Michèle Reduron-Ballinger, Hèléne Roche and Jacques Tixier
1999 *Technology and Terminology of Knapped Stone*. Translated by J. Féblot-Augustins. Cercle de Recherches et d'Etudes Préhistoriques Nanterre Cedex

Jennings, Thomas A.
2011 Experimental production of bending and radial flake fractures and implications for lithic technologies. *Journal and Archaeological Science* 38:3644-3651.

Miller, Michael J.
2006 An Experimental Study of Lithic Biface Manufacture: Toward Understanding the Perverse Fracture, Department of Archaeology, University of Exeter, Exeter.

Mobley, Charles M.
1982 The Landmark Gap Trail Site, Tangle Lakes, Alaska: Another Perspective on the Amphitheater Mountain Complex. *Arctic Anthropology* 19(1):81-102.

Muto, Guy Roger
1976 The Cascade Technique: An Examination of A Levallois-Like Reduction System in Early Snake River Prehistory. Ph.D., Anthropology, Washington State University, Pullman.

Patterson, Leland W.
1079 Quantitative Characteristics of Debitage from Heat Treated Chert. *Plains Anthropologist* 24(85):255-259.

Pelcin, Andrew W.
1997 The Formation of Flakes: The Role of Platform Thickness and Exterior Platform Angle in the Production of Flake Initiations and Terminations. *Journal and Archaeological Science* 24:1107-1114.

Purdy, Barbara A. and H. K. Brooks
1971 Thermal Alteration of Silica Minerals: An Archeological Approach. *Science* 173(3994):322-325.

Quinn, George D.

2006 *Fractography of Ceramics and Glasses*. Special Publication 960-16 National Institute of Standards and Technology, Unites States Department of Commerce. United States Government Printing Office, Washington.

Rick, John W.
1978 *Heat-Altered Cherts of the Lower Illinois Valley: An Experimental Study in Prehistoric Technology*. Northwestern University Archaeological Program Prehistoric Records 2. Northwestern University, Evanston.

Rick, John W. and Sylvia Chappell
1983 Thermal Alteration of Silica Materials in Technological and Functional Perspective. *Lithic Technology* 12(3):69-80.

Sandgathe, Dennis M.
2005 *Examining the Levallois Reduction Strategy from a Design Theory Point of View*. John and Erica Hedges Ltd. British Archaeological Reports, Oxford.

Speer, Charles A.
2010 Understanding the Effects of Heat Treatment of Edwards Plateau Chert. *Ethnoarchaeology* 2(2):153-172.

Titmus, Gene L.
1985 Some Aspects of Stone Tool Notching. In *Stone Tool Analysis: Essays in Honor of Don E. Crabtree*, edited by M. G. Plew, J. C. Wood and M. G. Pavesic, pp. 243-264. University of New Mexico Press, Albuquerque.

Towner, Ronald H. and Miranda Warburton
1990 Projectile Point Rejuvenation: A Technological Analysis. *Journal of Field Archaeology* 17(3):311-321.

Tsirk, Are
1979 Regarding Fracture Initiations. In *Lithic Use-Wear Analysis*, edited by B. Hayden, pp. 83-96. Academic Press, New York.

1997 Title., in press.

2010 Fracture markings from flake splitting. *Journal and Archaeological Science* 37:2061-2065.

Van Peer, Philip
1992 *The Levallois Reduction Strategy*. Monographs in World Archaeology No. 13. Prehistory Press, Madison.

Whittaker, John C.
1995 *Flintknapping: Making and Understanding Stone Tools*. University of Texas Press, Austin.

WCRM LITHICS LABORATORY MANUAL
NEWMONT LONG CANYON

February 7, 2017
Revised May 19, 2017

PHASE IV. TECHNOLOGICAL ANALYSIS OF TOOLS

The fourth phase of laboratory analysis is the formal, technological attribute analysis of tools. As with debitage, tools generally are collected from controlled one meter square units in arbitrary 10 cm levels or by stratigraphic layer or a combination of the two methods. Tools are also frequently collected from the general site surface and sometimes from features, auger tests, shovel test probes, and backhoe trenches. Below, the individual provenience and tool data to be recorded are described in detail in order to permit entry of tool attributes into the database.

Extreme care is necessary when analyzing, coding, and entering data. Each attribute of each artifact can be an important element for the interpretation of past human behavior. **Please be careful and accurate.**

Please do not leave any fields in the database blank - people doing the analysis later do not know if a field was left blank on purpose or if it is a mistake. If a field does not apply to a certain artifact, put a dash (-) in that space. For example, if an artifact was not point-provenienced, enter a dash (-) in the ProvN/Prov E and Depth fields. However, if a field has a list of selections to choose from, you **MUST** choose one of those selections. If you feel that there is not an appropriate selection for a particular artifact, see the lab director about adding one.

CATALOG NUMBER: This is a number assigned to each artifact and its purpose is to make every data entry unique. Catalog numbers are tracked using the digital artifact inventory; please take care to avoid assigning duplicate catalog numbers.

SCAT NUMBER: This number indicates the catalog number of the bag of debitage where the sample came from. This is critical as it ties the sampled flake back to its original provenience

BOX NUMBER: Number of box where artifact is located. Always write the box number on the bag or envelope so that if the artifact is somehow separated from the collection it may be returned to its original box.

OUTBOX NUMBER: Number of outbox assigned to items sent for outside analysis. These boxes are temporary locations. When the item is returned it should be placed back in its original box.

SPECIMEN NUMBER: This number is assigned when an artifact is sent for outside analyses. If not applicable, enter "-".

ANALYST'S INITIALS (AnInit): Put your initials here.

ANALYSIS DATE (AnDate): The date the analysis was done.

PROVENIENCE DATA

DISCOVERY NUMBER: Enter the discovery number that was assigned to the site. If no discovery number was assigned, enter a dash "-".

AGENCY NUMBER: CrNV-XX-XXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

STATE NUMBER: 26EkXXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

LOCUS: Enter the locus designation, if applicable.

CONCENTRATION NUMBER (Conc): Enter the concentration number, if applicable.

SHOT NUMBER: Shot number is typically only assigned for artifacts collected using a total station.

BACKHOE TRENCH NUMBER (BHTrench): Enter the backhoe trench number, if applicable.

AUGER TEST: If item was recovered from an auger test, put the number of the auger test from which the item was collected.

SHOVEL TEST: Designation of the shovel test unit, if applicable.

EXCAVATION/TEST UNIT (Ex/Test Unit): Enter the Excavation or Test Unit number, if applicable.

GRID: If the material was recovered from a feature or unit in one of the collection grids, put the grid designation here.

GRID N: This refers to the northing, or the north coordinate, of the southwest corner of the 1 m x 1 m **excavation unit.** The excavation grid coordinates are always justified to the southwest corner which is directly related to the primary collection grid datum which has been given the arbitrary Cartesian coordinates of 100 m north/100 m east. In other words, a unit with a grid north designation of 105 north is five meters north of the primary collection grid datum. Enter only integer values (do not add "N").

GRID E: This refers to the easting, or the east coordinate of the southwest corner of the 1 m x 1 m **excavation unit**. This is encoded just like a north coordinate (e.g., a unit with a grid east designation of 105 east is five meters east of the primary collection grid datum). Use only the integer value.

PROVENIENCE NORTHING/PROVENIENCE EASTING (PROVN/PROVE): Horizontal provenience of a point-provenienced specimen, measured to the nearest centimeter. Provenience will be expressed as meters north and east, i.e. N100.25/E99.35, but only the number needs to be

recorded (do not add “N” or “E”). Items collected with GPS units will typically have UTMs associated with them and they should be added to this field as well.

PROVENIENCE ELEVATION (PROV ELEV): Absolute elevation of a point-provenienced specimen, measured to the nearest centimeter relative to the local excavation datum. This field should only be used when PROVN/PROVE are used.

UNIT LEVEL: For excavation units: this refers to the arbitrary 10 cm levels numbered sequentially from the surface. Surface artifacts from excavation units are coded as level “0“. TElev and BElev are the top and bottom elevations of the level.

For surface collected artifacts in 1 x 1 m units within the grids: code as level “0” and put a dash in TElev and BElev. For artifacts collected from the surface throughout the site: code as level “0” and put a dash in TElev and BElev.

UNIT STRATUM: Enter the stratum designation, if applicable. Otherwise enter “-“. If you notice that an artifact from a particular site does not have a stratum entry, but all the others do, then take the time to find the correct data in the appropriate records.

FIELD SPECIMEN NUMBER: Enter the field specimen number.

ANCILLARY FIELD SPECIMEN NUMBER: Enter the field specimen number.

TELEV: The top elevation of the level in which the artifact was located is recorded for excavated artifacts.

BELEV: The bottom elevation of the level in which the artifact was located is recorded for excavated artifacts.

FEATURE NUMBER: Feature number, if artifact is from a feature. Otherwise enter “-“.

FEATURE PORTION: Horizontal provenience of the feature, e.g. N1/2 or NE1/4.

FEATURE LEVEL: this refers to the arbitrary 10 cm levels numbered sequentially from the origin (or truncated surface) of the feature.

FEATURE STRATUM: stratum designation assigned to feature depsosits.

GENERAL DATA

MATYP: Material type of specimen.

Chert
Fine-Grained Volcanic Rock (FGVR)
Obsidian
Quartzite
Other (specify your thoughts on material type in comments)
Indeterminate

COLOR: Enter color using the simple color designations (below). Pick the dominant color (**closest match**) or in the case of variegated material choose that option.

Black
Gray
Red/Pink
Yellow
Orange
Green/Greenish Blue
Blue/Purple
Brown/Tan
White
Variegated
Colorless/Translucent

THERMALT: This category includes those **chert** materials which have been intentionally and successfully heat treated and those that have been burned (intentionally or not). If the material is not chert enter **Not Applicable**. Differential luster is the best evidence of heat treated items (usually a waxy luster fresh fracture surfaces with a matte luster on old scars). On occasion, color changes are evident (reddened exterior flaked surface with orange waxy interior flake scars). Crazing, spalling, the presence of pot lids, thermal fracturing, and/or a vitreous luster is present on burned items. There are examples of these features in the type collection. In the last 40 years numerous studies have investigated the changes that occur to stone during heat treatment (Bleed and Meier 1980; Buenger ; Patterson 1079; Purdy and Brooks 1971) . Flintknappers have long recognized that heat treatment increases the “workability” of chert. Heat treatment tends to make the chert more brittle (Domanski and Webb 1992; Flenniken and Garrison 1975; Griffiths, et al. 1987; Rick 1978; Rick and Chappell 1983). The “level” of brittleness may be determined by certain temperature ranges obtained while heat treating (Speer 2010).

Thermally Altered/Burned. Includes those artifacts that exhibit crazing, spalling, pot lids, and/or vitreous luster. These attributes suggest it was unlikely that the object was deliberately heat treated.
Heat Treated. Includes those artifacts that exhibit differential luster. For example, this would include chert artifacts that exhibit waxy luster flake scars on matte surface. Examples are in the type collection and an image of differential luster is below. This category is defined to capture those artifacts that were deliberately heat treated.
None. **Chert** material with no indication of either thermal alteration or heat treatment.
Not Applicable. Includes all **non-chert materials**.

Fire Creek, Locus AC, burned flake (left). Note the potlids and crazing. Fire Creek, Locus S (right). Note intense crazing.

Hycroft biface with heat treatment in the form of discoloration. Waxy orange flake scars intrude into and have removed the more matte reddened previous flake scars.

An example of differential luster. Right arrow indicates lustrous area, left arrow to non-lustrous area.

CONDITION: Condition of specimen in terms of completeness. Note that this definition does not follow our method of determination of flake completeness used during flake analyses.

> **Complete.** If the artifact appears to be complete enter as complete. If the tool only has one use then make your best assessment as to whether the tool is complete or incomplete. If it is a utilized flake and the used edge(s) appear to be intact then consider it complete. If the tool is a

utilized flake with a broken used edge, but the last use appears to have been as a graver and the graver edge is complete, then the tool is considered complete. If a tool appears to have been a side scraper but now has a radial break with only a small scraping edge remaining, then consider it incomplete.

Incomplete. Tools that are clearly missing parts. For example: lateral, medial, distal fragments of flake tools would be entered as incomplete.

Indeterminate. Use sparingly.

ULTRAVIOLET FLOURESCENCE AND LITHIC SOURCING

As geologists and mineralogists have long known, certain minerals fluoresce when stimulated by ultraviolet light (Raytech Industries 1965). Ultraviolet light (UV) is not visible to humans. UV interacts with atoms in the fluorescent material, transforming the energy in the electron shells of atoms and causing them to emit photons in the visible spectrum. The color or the fluorescence depends on the chemical composition of the mineral and, to a lesser extent, on the wave length of the UV radiation. Compared to daylight or ambient artificial light, the stimulated fluorescent light is faint and must be viewed in darkness.

The sources of toolstones can be distinguished by their behavior under UV light according to Hofman et al. (1991). Identifying chert toolstone sources and quantifying the frequencies of local and non-local cherts within lithic assemblages from the sites in the project area is an important aspect of the Lithic Terrane analysis. Hofman and his colleagues were able to distinguish Knife River Flint, Edwards Plateau Chert, and toolstone from the Alibates source in Paleoindian assemblages from the Great Plains. The same methods can be applied to analysis of all chert tools and projectile points recovered from the Long Canyon sites as well as control samples of toolstones from local and regional toolstone quarries.

A Raytech Model LS-88CB UV lamp that can be switched between long (3500 angstrom units) and short (2600 angstrom units) wavelength light, or can provide both simultaneously, is used as the ultraviolet light source. All specimens will be inspected in a completely darkened room after a few minutes of eye adjustment. Specimens will be examined under long and short wavelengths and both simultaneously.

UV LONG: For chert flakes. How does the item fluoresce under longwave UV light? Especially if a flake has inclusions, there may be areas that fluoresce differently. Code the most prominent color, and describe in Comments if other colors are present, also. You may also want to put other details in Comments, also, such as if the flake fluoresces very strong or very faintly. Wear goggles with UV protection when using the blacklight.

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

UV SHORT: For chert flakes. How does the item fluoresce under shortwave UV light? Especially if a flake has inclusions, there may be areas that fluoresce differently. Code the most prominent color, and describe in Comments if other colors are present, also. You may also want to put other details in Comments, also, such as if the flake fluoresces very strong or very faintly. Wear goggles with UV protection when using the blacklight.

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

BIFACE DATA

CORTEX: Amount of cortex remaining on specimen. If incomplete enter as indeterminate. If you are not sure if the surface is cortical see lab supervisor.

Absent. Complete tool with no cortex.
1-25%. Complete tool with 1-25% cortex.
26-50%. Complete tool with 26-50% cortex.
51-75%. Complete tool with 51-75% cortex.
76-100%. Complete tool with 76-100% cortex.
Incomplete with Cortex. Incomplete tool fragment that has any amount of cortex.
Incomplete without Cortex. Incomplete tool fragment that has no cortex.
Indeterminate. Use only if you are unsure if the tool has cortex or not.

DO FLAKE SCARS CROSS THE MIDLINE OF THE BIFACE? Do **two or more** reduction and/or thinning flakes cross the midline or not? This is important in terms of biface stage identification.

Yes.
No.
Indeterminate. This should mainly be used for small fragments.

BIFACE STEP/HINGE COUNT: On all bifaces, please take the face with the most apparent hinge/step flakes and quickly tally them. Do not try to tally small, inconsequential edge trimming related step/hinge fractures along the edge. We are after those step and hinge fracture that are more than 2 or 3 mm from the tool edge and are obvious. If you have a series of three stacked steps in one area then count those as three and not one.

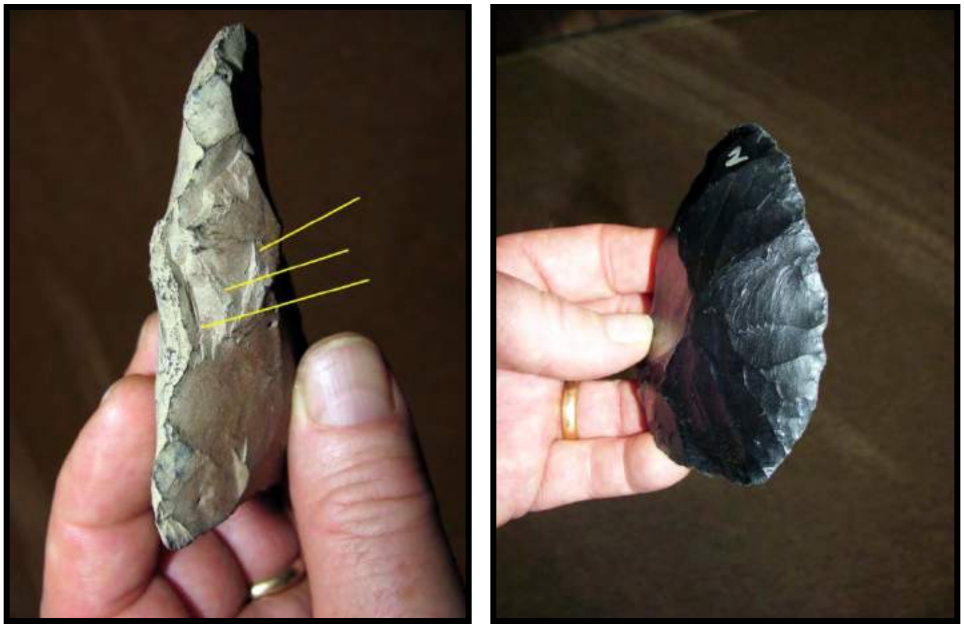
STACKED STEPS: Stacked steps are a series of two or more step or hinge fractures that are present on the face or edge of a tool. We are not looking to describe tiny insignificant fractures here. The stacked steps must be more than a couple mm from the edge of the tool. Stacked step fractures indicate that two or more blows were delivered to roughly the same area of the edge. The first blow resulted in a step fracture and the second and subsequent blows resulted in an accumulation of step fractures. This phenomenon is often related to novice flintknapping. Step and hinge fractures will cause the force to terminate and result in yet another step or hinge fracture. Experienced flintknappers will often remove the step fracture via another angle. Novices will strike repeatedly in the same area. Below is an example of stacked step fractures. Step or hinge fractures that are large and result in a "hump" or often not recoverable. Please make an assessment if you think the stack step fractures were significant enough to have resulted in the discard or fracture of the artifact. Seek a lab supervisor if you need assistance understanding this feature.

Not present
Present and significant, probably resulted in the discard or breakage of the artifact.
Present but can be overcome (not too large and no significant hump).

An example of significant and non-recoverable stacked step fractures.

QUALITY OF BIFACE FLAKING: This measures the quality of the flaking. Please take a look at the type collection of the biface stages. In Errett Callahan's cast examples, you will not see any large step fractures, "humps," concavities, or other irregularities to prevent the flintknapper from continuing forward. With a firm idea of the "idealized" biface sequence in mind, please observe the tool in question. We want to know if the biface has large "humps", concavities, or step fractures that would be difficult for the knapper to overcome. To assess this please take the biface and examine the flake scars. Are you observing more conchoidal non-step terminations (good) or step/hinge terminations (bad)? Are there areas on or near the edge that are deeply stepped or stacks of step fractures? Are there squared edges? You should go over this the first few times with a supervisor. If there is patterned finishing flaking present on the biface, for example, parallel oblique, chevron, well organized parallel flaking etc., please call this to the attention of a supervisor.

Excellent Flaking. Symmetry is excellent. Cross section is straight and centered. The majority of the flake scars terminate as feathers and there may be only a minor shallow step fracture or two and no significant concavities or humps to overcome for continued reduction of the biface (See casts of Callahan's Biface Stages).
Good Flaking. The biface has good symmetry. There may be a slight bit of irregularity in cross section. Step fractures present (more than two) and/or there are a couple areas of large stacked step fractures posing significant challenges to remove and/or which may have ultimately caused failure/rejection of the biface. There are examples of this in the type collection.
Poor Flaking. The symmetry is poor. There are areas of stacked step fractures and many scars end in step terminations around the biface. Squared edges and poor symmetry might be present as well. Further reduction of the piece would have been very difficult or impossible and thus, if complete, would be considered a "terminal" biface. There are examples of this in the type collection. All tools that have been identified as "teaching" or "learning" behavior should be considered part of this category.
Indeterminate. This should mainly be used for very small fragments.



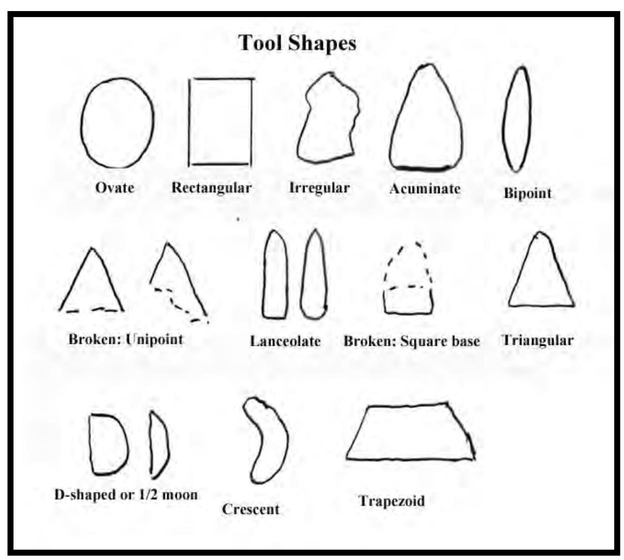
An example of stacked stepped fractures which posed a significant challenge to the knapper at Fire Creek (left) and probably resulted in the breakage of the piece. Errett Callahan's Stage II biface (right). Note that all Errett's terminations end in feathers and there are no significant blemishes to further continue working the piece.

COULD THIS TOOL REPRESENT LEARNING BEHAVIOR? Is the tool small, chunky, and looks as though it could represent the work of a novice attempting to "copy" a biface or projectile point? Many of the "terminal bifaces" should be entered as yes.

Yes.
No.

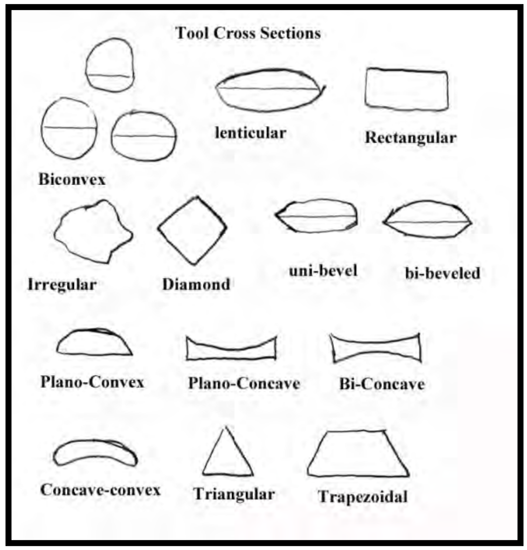
SHAPE: Shape of the specimen. If it is a biface or core fragment, enter the shape of the unbroken original artifact if you can reasonably infer what it was. Not applicable to retouched/utilized flakes.

Ovate or Round.
Square or Rectangular.
Irregular.
Acuminate.
Bipoint.
Unipoint. (broken biface tip)
Square base.
Triangular.
Trapezoidal.
Lanceolate.
D-shaped.
Crescentic. (crescent shaped)
T-Shaped. (for drills)
Indeterminate.



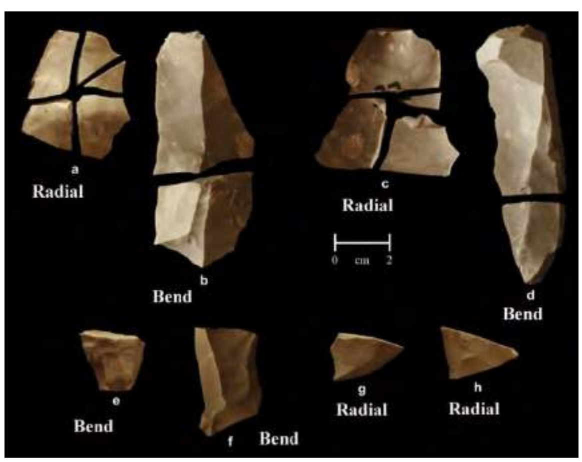
X-SEC: Cross section of specimen. For bifaces you should describe the cross section of the width of the biface. Not applicable to retouched/utilized flakes. Typically lenticular will be the best choice to define a biface cross section.

Biconvex.
Lenticular.
Square or Rectangular.
Irregular.
Diamond.
Beveled. (one edge)
Bi-beveled. (two edges)
Plano-convex.
Plano-concave.
Biconcave.
Concave-convex.
Triangular.
Trapezoidal.
Indeterminate.



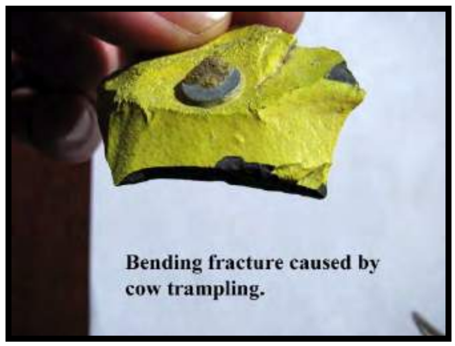
DOES THE TOOL EXHIBIT EVIDENCE FOR A RADIAL BREAK? (See below Figures): Radial breaks are caused by downward force such as a deliberate hammerstone strike or sometimes trampling or even knapping errors. Hammerstone strikes can leave traces of deliberate breakage (see intentional breakage diagram below). Lips are more of a characteristic of bending breaks produced during biface manufacture than deliberate radial breakage. A typical radial break will have two or more laterals with approximate 90 degree breaks (see below illustration). Jennings (2011) study found radial breaks produced during biface production are significantly thicker than those produced during intentional radial breakage of flakes. There are examples of radial breakage in the type collection.

Yes.
No.
Indeterminate. Use sparingly.



A and B are the result of deliberate breakage, C and D trampling and e-h were produced during biface manufacture (adopted from Jennings 2011:Figure 2).

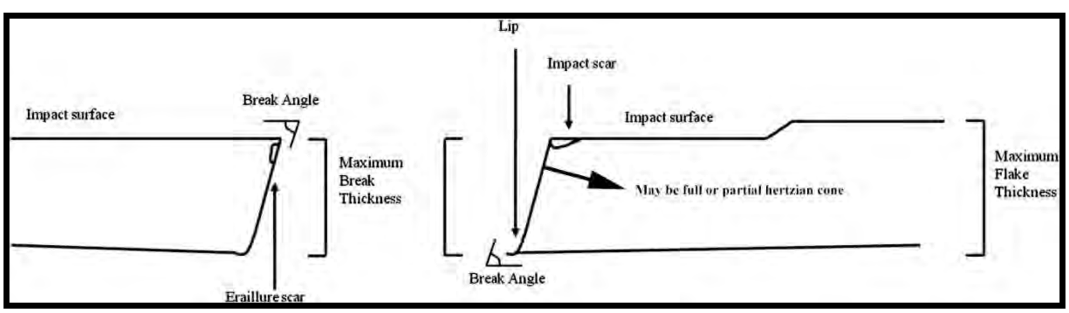
An example of biface broken by bending and radial fracture (adopted from Miller 2006:Figure 5.22) caused by thinning with a antler billet with poor support of the tool.



This bending fracture resulted from cow trampling. The fracture is close to 90 degrees with a distinct compression lip.

DOES THE TOOL EXHIBIT EVIDENCE FOR INTENTIONAL BREAKAGE? Intentionally striking a tool with a hammerstone or billet can leave distinctive evidence in the form of subtle impact scars above the break, errailure scars on the break, partial Hertzian cones (bulb) on the break. Intentionally striking a biface or other tool can be a fast way to produce sharp projections for tasks such as scoring bone. Do not attempt on tools smaller than approximately a quarter.

> **Yes.** Our macroscopic observations (hand lens ok) should include trying to identify presence/absence of an impact scar on the tool surface **at break**, a partial Hertzian cone on the break surface, and/or an errailure scar on the break surface.
> **No.**
> **Indeterminate. Use sparingly.**



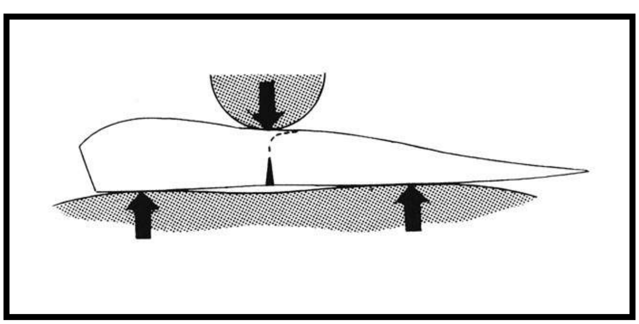
Some indications of direct flake breakage (from Jennings 2011:Figure 1).

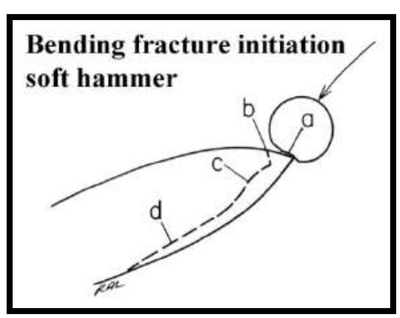
DOES THE TOOL EXHIBIT EVIDENCE FOR AN UNINTENTIONAL PERVERSE/BENDING/SPIRAL/HERTZIAN (BOTH TRANSVERSE AND LONGITUDINAL) BREAK? Classify any flake siret breaks as "NO". Perverse Fracture – "A spiral-shaped fracture that is initiated at or near the edge of a biface. Improper platform alignment, preparation, and / or strike in relation to the biface plane causes bending in the mass of the object. Due to the angle of force, the fracture reorients itself perpendicular to the biface plane. An internal fracture within the biface or a crack that separates the biface into two sections may result" (Miller 2006:65).

Yes.
No.
Indeterminate. Use sparingly.

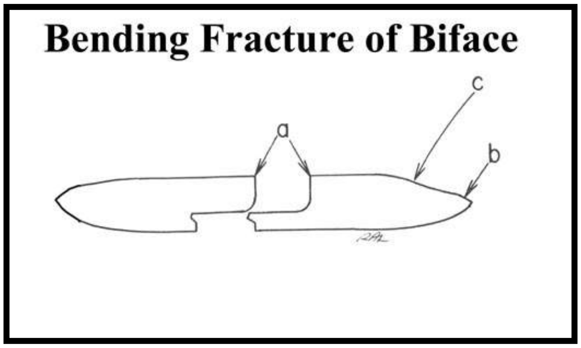
An example of a biface broken by a bending fracture during late thinning. "The percussor was the small antler and the support method was on the leg. The fracture initiated above the biface plane and the resulting scar is bifurcated by the crack; the detached flake is also broken along this crack. The platform of the flake was truncated from the body of the flake on removal and was not recovered" (Miller 2006:38).

Note the compression curl on left piece. Miller describes the process that broke this tool, "…this biface was broken in two places due to bending fractures. Striking a thinning flake from the base, that did not release, caused the energy from the blow to snap the biface to the left of the strike and in the centre of the piece. It is likely that the centre broke due to it being thinner than the ends." (Miller 2006:43-44).

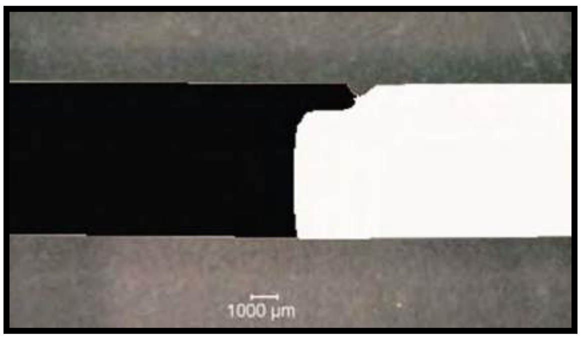




Left, forces that can result in "reverse-hinge terminations" (After Cotterell and Kamminga 1987:Figure 4). Right, soft hammer compression at platform (a) bending fracture initiation (b) formation of a slight bulb (c) and crack continuation (d) (after Whittaker 1995:Figure 8.10).



An illustrated example of reverse-hinge fracture (a) in a biface. The blow should have struck at point (b) but instead was too far into the tool at point (c) (after Whittaker 1995:Figure 8.12).



Bending terminations will exhibit a compression curl as illustrated above (modified from Quinn 2006:Figure 4.10 (d)).

DOES THE TOOL APPEAR TO HAVE BEEN BROKEN AS A RESULT OF A MATERIAL FLAW? There are several examples of this in the type collection. Evidence may be in the form of termination at a vesicle or inclusion or point of drastic change in material quality**.**

Yes.
No.
Indeterminate. Use sparingly.

“Impurities” in this Tosawihi Chert caused the step fracture.

Is the biface fragment part of an overshot flake?
Yes
No

Is the biface fragment part of an edge bite flake?
Yes
No

Is it part of either an overshot or edge bite flake but can't be certain which one?
Yes. If you select Yes here make certain that you have selected no to the above two questions.
No. If you select No make sure the above two are also no.

DOES THE TOOL EXHIBIT USE-WEAR? If so pick the best descriptor below. Please go over what constitutes trampling damage, pronounced use-wear with Geoff. There are also examples of polish formation on tools in the type collection. This is only meant to be a quick 1 minute assessment from which a sample will be taken at a later date. The mistake many analysts make regarding bifaces is that they confuse edge trimming and strengthening of platforms along the edge for use-wear. If you suspect that you have a biface that exhibits use-wear please bring to the attention of a lab supervisor for quick assessment.

> **Absent.** There is no evident use-wear.
> **Pronounced with Good Integrity.** The tool has pronounced use-wear in the form of ***very*** visible (**no magnification**), patterned attrition scars along one or more margins. The patterns are regular enough not to be confused with trampling.
> **Subtle with Good Integrity.** The tool has subtle use-wear attrition along one or more edges. This would include very small edge scarring that requires a hand lens to observe.
> **Possible Use-Wear but Compromised.** Possible use-wear pattern(s) is apparent, but the tool also exhibits evidence, in the form of sharp edge breaks, that could be interpreted as trampling or other post-depositional modifications. These are tools that should not be selected for use-wear study.
> **Indeterminate. Use sparingly.**

DOES THE APPARENT UTILIZED EDGE EXHIBIT EVIDENCE FOR POLISH FORMATION AND/OR STRIATIONS? Take a quick look at the tool under a light with your hand lens. This is to help us identify a sample for high power examination.

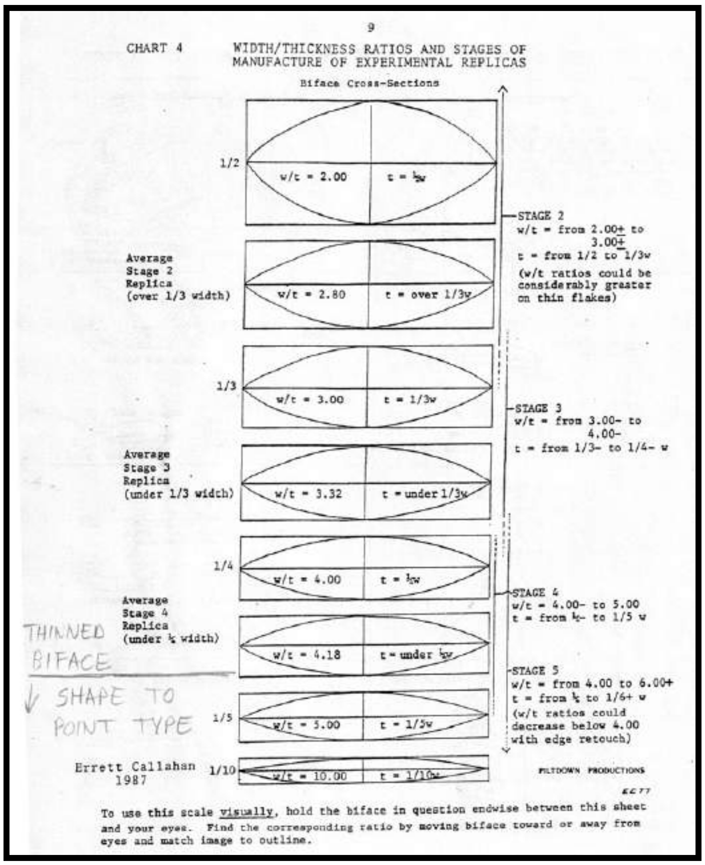
> **Yes.** There is a reflective band, spot or other area of polish. Be careful to not be fooled by oil/moisture from fingers. What we are looking for here are discrete areas that are polished NOT ubiquitous polish along an edge.
> **No.** There is no evidence for any areas on the tool edge that are polished.
> **Indeterminate. Use sparingly.**

BIFACE TYPE: Select the most appropriate stage for the analyzed biface. Do not attempt to assign biface stages to flake based projectile preforms. These have their own tool types. See laboratory supervisor if you perceive a problem.

NOTE: If you have a combination tool (e.g., biface/scraper, scraper/graver, etc), input the primary tool type in the ToolType1 slot, and the secondary tool type in the ToolType2 slot. Primary versus secondary tool types can be distinguished on the basis of which covers a larger area on the tool, or which appears to be used more intensively.

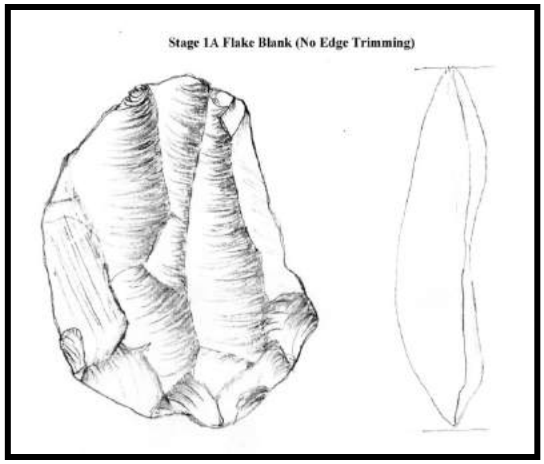
Biface (generic/small fragment). Bifaces are entered as generic if for some reason, you cannot assign the piece to a particular stage (e.g., highly fragmentary specimens). These tools are often difficult to distinguish from generic or exhausted cores. What we want to see on these artifacts are bifacial flake scars (not edge trimming) present on a piece that looks like it may have originated from somewhere in the biface making trajectory.

The stages described below are from Callahan's research (Smallwood 2010). Stage I has been slightly modified to accommodate large unmodified flake blanks as well as blanks with slight edge trimming modifications. The stages should not be viewed as concrete positions as the steps of producing a bifacial tool flow along a continuum. His first stages have been identified as very applicable to a general bifacing trajectory anywhere in the world. **There are cast examples of each of these stages in the lab and each of you has been given a visual aid to help understand where the piece in question is at on the "continuum".**



The above chart should be used to help facilitate your placement in biface stages I-IV. Please use the full-size chart that you were provided (from Callahan 2000:Table 5).

Stage IA Biface-BLANK. This is an unmodified piece such as a large > 5 cm max dimension flake blank that could serve to produce a biface. These potential biface blanks will not be analyzed as tools, but should be analyzed in the debitage analyses and write up. If you encounter such a flake, please discuss it with the lab supervisor and ask how to proceed.



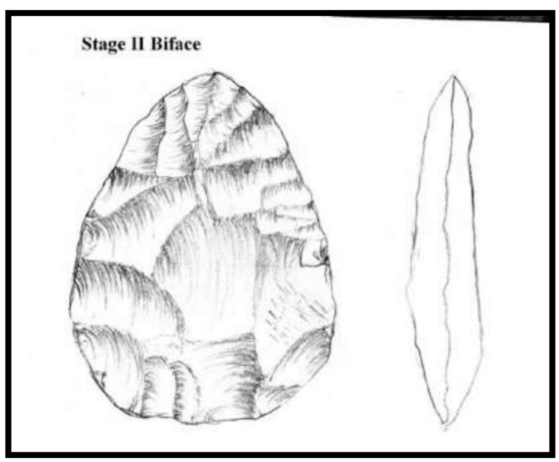
Stage 1A Biface. Errett Callahan, unmodified large spall/flake.

This Stage IA Biface blank from Locus A/R at Fire Creek (FS 79) exhibits a deep material flaw (lower left) as well as probable trampling attrition (top left margin).

Stage IB Biface-Preform. This is a **slightly** modified piece such as a large flake blank that could serve to produce a biface. Shape is irrelevant. The piece may have been rejected for obvious material flaws. You are looking for flake "blanks" with slight edge trimming (to strengthen platforms) or perhaps one or two flakes have been removed. Otherwise no other modifications have occurred. Note that platform trimming can easily be confused with use-wear. Consult a lab supervisor if you are in doubt. These tools should be analyzed as bifaces.

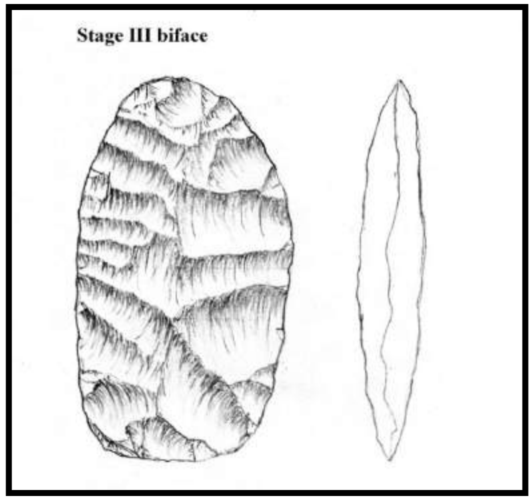
An experimental example of a large stage IB biface. Note edge trimming along lateral margin. Otherwise, the preform has not been modified. A large Stage IB Biface from Fire Creek Locus S. The only modifications done to this large biface blank was considerable edge trimming along the margins.

Stage II Biface. The emphasis is placed on the outer zone creating a circumferential and roughly centered edge (ideally between 55-75 degrees). No attention paid to central zone, cross-section, or shape. Shape and width-thickness ratios vary in the extreme. These bifaces will have a roughly centered and biconvex edge. There still should be considerable mass or a "hump" left along the center portion of the biface.



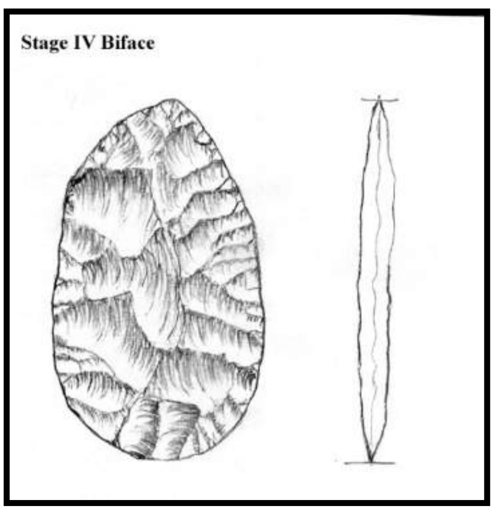
Errett Callahan, Stage II biface from type collection.

Stage III Biface. The emphasis is on creating a symmetrical hand axe-like outline with generous, lenticular cross-sections, and a straight and centered bi-convex edge. Width thickness ratios should fall between roughly 3.0-4.0, while edge-angles should fall between about 40-60 degrees. Focus shifts to the middle zone while keeping the outer zone in control. The main flakes will be contacting or slightly overlapping the middle zone. Flakes that reach or just barely cross the midline are referred to as "primary thinning flakes."

Errett Callahan, Stage III biface from type collection.

Stage IV Biface. The emphasis shifts to creating a symmetrical outline with flattened, lenticular cross section and a straight and centered, bi-convex edge. Thickness reduces so that width-thickness ratios are roughly between 4.0 and 5.0 or more. Edge angles are roughly between 25-45 degrees. The focus is on the middle zone with main flakes overlapping at the middle. This is the stage from which just about any point type may be made. In general, in order for you to use this category the biface in question needs to have been "thinned considerably" and these thinning flakes should include more than two that cross the midline of the biface. These types of thinning flakes are often referred to as "secondary thinning flakes".

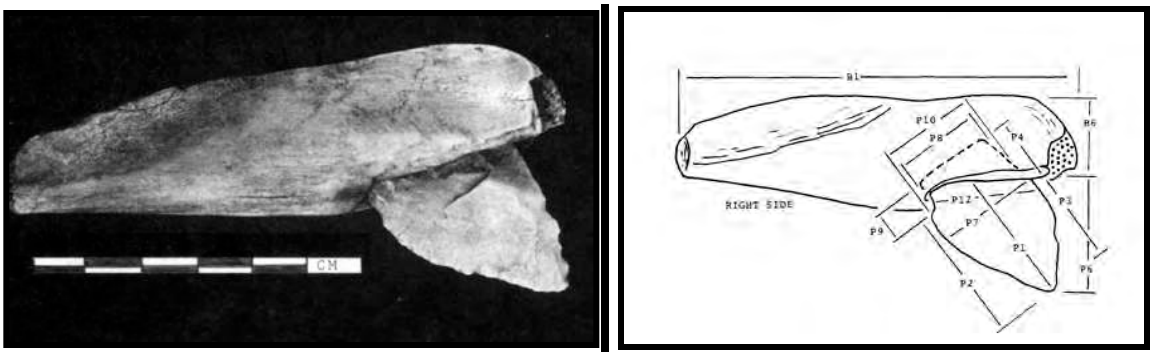


Errett Callahan, Stage IV Biface from Type Collection.

Flake-Based Biface A. A flake-based biface that generally has a well-flaked dorsal surface and only minor edge retouch on the ventral face (original ventral flake surface still visible). Flaking is primarily Percussion-based. Shape is usually pointed and suggests it may have been broken during projectile point manufacture.

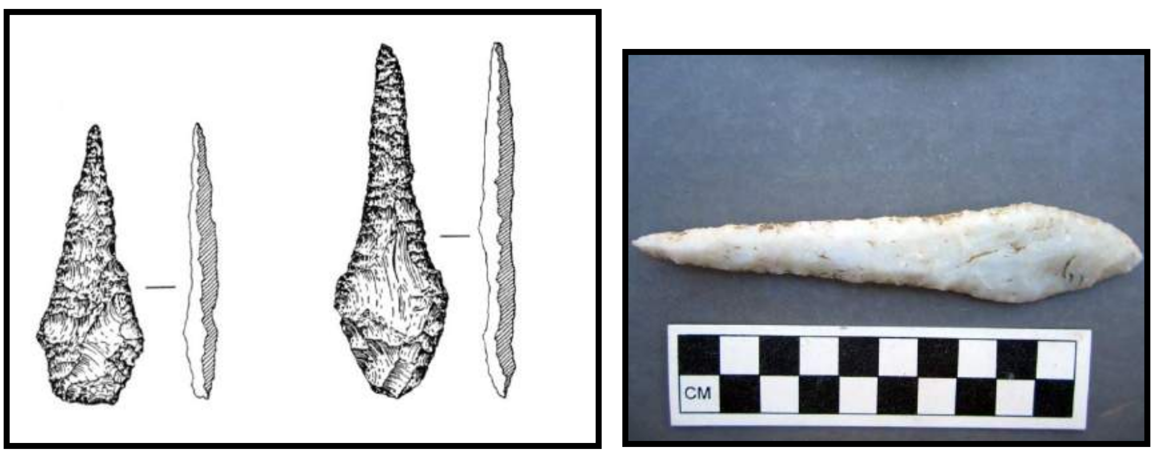
Flake-Based Biface B. A flake-based biface that generally has a well-flaked dorsal surface and only minor edge retouch on the ventral face (original ventral flake surface still visible). Flaking is primarily Pressure-based. Shape is usually pointed and suggests it may have been broken during projectile point manufacture.

Knife (bifacial). This is a finely flaked bifacial tool with a very centered straight edge with a narrow edge angle and may or may not have been hafted. It should be similar to a Stage IV biface and will most likely have an associated use-wear pattern on the edge. If you are having trouble distinguishing between a projectile preform and a knife, consult a lab supervisor.



An example of a bone hafted knife from Plum Canyon Colorado (after Hartwell 1995:Figures 1 and 2).

Shoshone Knife. This is a particular biface type from the late prehistoric period. These tools have a distinctive shouldered appearance possibly resulting from continuous re-sharpening or they may have functioned as drills (Slesick 1978:170). They often have distinct use-wear patterning.



Left: Examples of shouldered bifaces known as Shoshone knives (after Slesick 1978:Figure 20.7). Right: An example of a Shoshone knife from CrNV-02-11174 (Locus 83).

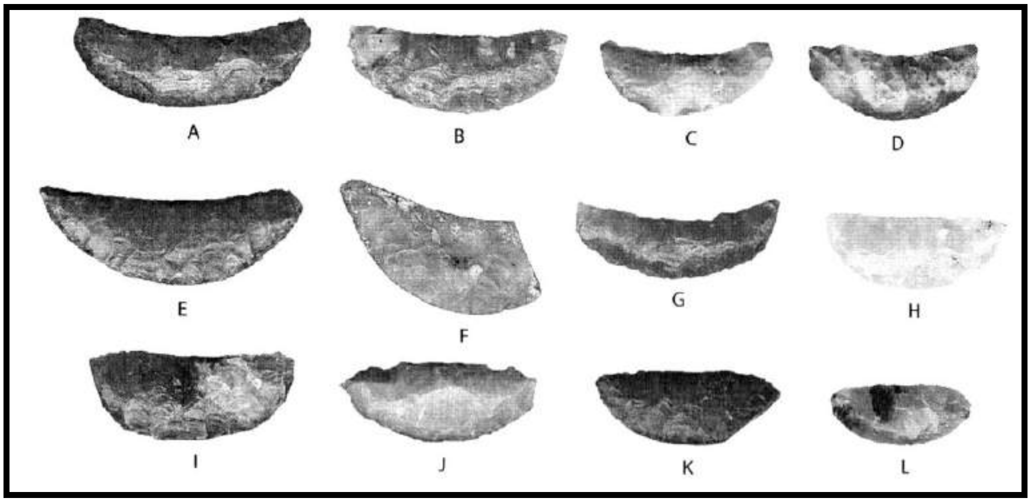
Expedient Knife. Also called "Tule knives," these tools are typically made from a naturally fairly large sharp spall or flake and are primarily defined by use-wear along a cutting edge. The edge may or may not be serrated, but some modification or use must be noted along the working edge. In the Great Basin, they are thought to have been used to harvest reed grasses. Consult a lab supervisor before using this type.

Expedient (Tule) Knife recovered from CrNV-22-4102 in the Black Rock Desert. The convex edge on the lower left exhibits use-wear conducive to cutting thick grasses like wild rye, tules, or cattails.

Tabular Knife. A flat, tabular piece of material (occasionally called "vein agate") with cortex on both faces and at least one bifacially flaked margin, possibly used as a knife.

Tabular knife recovered from Locus A/R at Fire Creek. It is a thin tabular piece of chert with rough cortex on both faces and a single, bifacially-flaked edge for cutting.

Crescent. This is a very specific tool type typically associated with Paleoarchaic assemblages. They are bifacially flaked and generally made from chert. Their form varies considerably with quarter-moon, half-moon, butterfly, and eccentric types. Examples from the Sunshine Locality are depicted below.



Examples of crescents from the Sunshine Locality (modified from Beck and Jones 2009:Figure 5.15).

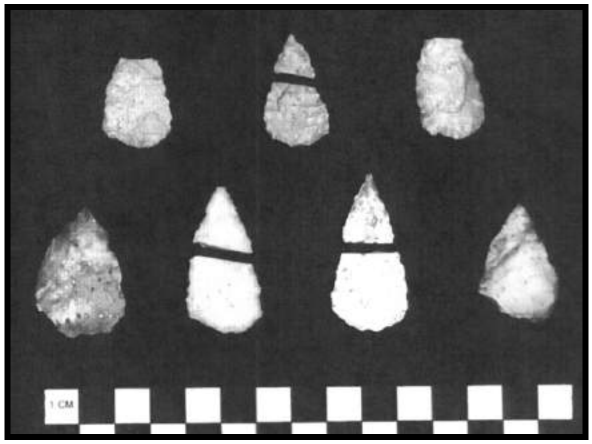
Formal Drill. This tool has been formally shaped with a long, thick (often diamond-shaped) bifacially flaked drilling projection and a wide, flat hafting element. A common shape is depicted below.

A formally shaped drill from Fire Creek (left) and a replicated hafted drill (right).

PREFORM TYPE: For all stage bifaces and flaked based bifaces, determine whether they may also be considered one of the following preform types. Select the most appropriate type from below. See laboratory supervisor if you perceive a problem.

<u>Arrow Preforms</u>

Rose Spring (Rosegate) preform. Rose Spring preforms are generally acuminate in shape. They are produced on flakes and range in length between approximately 3.5 and 4.5 cm, and are 2 to 3.5 cm wide and 0.3 to 0.4 cm thick. They can exhibit blunted margins but it is not clear whether this results from manufacture or use. Examples of Rosegate preforms are below.



Examples of Rose Spring Preform/Knife (from Stoner 2001:Figure 18).

An example of a Rosegate arrow preform. Note the pressure flaking and that ventral vestige is present.

Desert Series Preform. Small triangular preforms with straight, concave, or slightly convex bases. These are flake-based preforms and may only have slight ventral retouch (should be entirely pressure-flaked). Thickness should generally be ⩽ 4 mm (less than or equal to) and weight should generally be ⩽ 1.6 grams (less than or equal to).

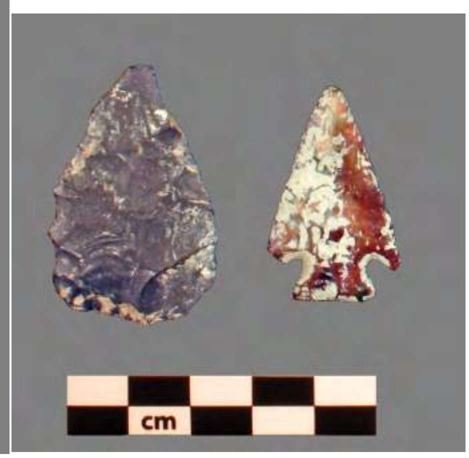
Indeterminate arrow preform. Typically, this is a partial biface/preform with a size indicative of an arrow trajectory.

Arrow preform that was made from a dart point tip. These may have an obvious break on the base with pressure modification to the laterals and/or base. They generally are “chunkier” than a flake based preform.

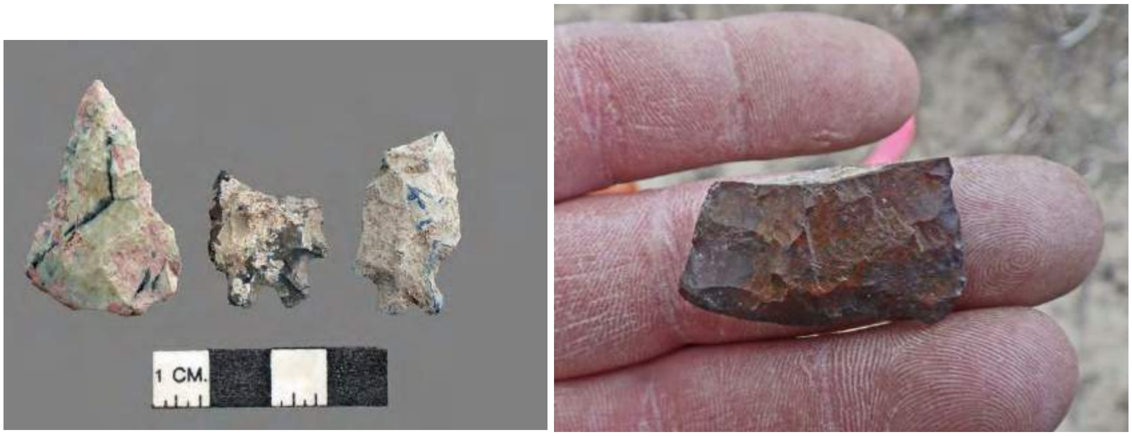
<u>Dart Preforms</u>

Large Side-Notched dart point preform. The characteristics will include large lanceolate, triangular with a straight base. An example is illustrated below.

Acuminate shaped (curved laterals and curved base) and possibly indicative of an Gatecliff, Elko or similar dart preform. Examples of an acuminate shaped dart preforms along with Elko points are depicted below.



Is the stage biface/preform or preform fragment more sub-triangular shaped (straight laterals and curved base) and possibly indicative of Gatecliff, Elko or similar dart preform? Examples of sub-triangular dart points are depicted below.



Examples of sub-triangular shaped preforms and Gatecliff points (left) and another example of sub-triangular dart preform (right).

Is the stage biface/preform or preform fragment more oval or sub-round? An example is shown below.

Examples of oval type preforms.

Indeterminate Dart Preform. Medium to large bifaces with straight, concave, or slightly convex bases and shapes including acuminate, triangular, and large rectangular. These may be flake-based bifaces or entirely bifacial. Flaking is dominated by percussion though some pressure may be present too. These may overlap somewhat with Rosegate Preforms/Knives in maximum width, but are generally thicker, longer, and more robust. Dart preforms could have been fashioned into any number of Early to Middle Archiac dart point types (Pinto, Large Side-notched, Humboldt, Gatecliff, Elko, etc.). Choose this only if the preform or preform fragment cannot be placed into more specific size/type described above.

Indeterminate Projectile Preform. Typically a basal fragment of an indeterminate style or association. Usually has one or more characteristics similar to two of the three preform types (Desert, Rosegate, or Dart). Consult a lab supervisor if in doubt.

PALEOARCHAIC STEMMED POINT PREFORMS: These categories are applicable to stemmed point preforms. Please see lab supervisor when you encounter these tools. Most should already by "pre-analyzed" as to appropriate stage.

Is the stage biface a Stage II stemmed point rough out? The focus in this stage is on establishing a symmetrical edge and a roughly bi-point shape. Flakes are removed primarily from the outer perimeter. There is little emphasis put on shape or cross section at this point. From what I have seen at Fire Creek, this flaking was done with a hammerstone. Flakes will tend to have fairly large platforms; ridge strikes, and pronounced bulbs are common.
Yes
No

FS 1373, Locus A/R, Fire Creek stemmed point stage II rough out. Emphasis is on establishing rough symmetrical edge and bipoint shape.

Is the stage biface/preform a Stage III stemmed point preform? There is a shift from the outer zone to thinning the middle zone with emphasis on thinning blade section and maintaining thick hafting element. The cross section moves from thick biconvexity to fairly thin and regular.
Yes
No

Locus A/R surface collection, Stage III stemmed point preforms.

FS 1217, Locus A/R, Fire Creek, Stage III preform. Note symmetry and thick lenticular cross section.

Is the stage biface/preform a Stage IV stemmed point preform? Movement is towards creating a flattened cross section with a straight and centered bi-convex edge and establishing the general shape characteristics of the stemmed point. **Major flaking effort is in the middle zone at which point bilaterally driven flakes may overlap.** These are very difficult thinning flakes to remove and we will likely pick up quite a few "overshot" flakes. I believe this is the stage when most shaping of the stemmed point base and tip occurs. Flakes will have curvature to reflect the biconvexity of the biface. The emphasis begins to move away from ridge strikes which remove lots of mass. Based on what I have seen in the A/R extension, it could be in this stage ***that movement from hammerstone use to billet use occurs.*** These flakes can have smaller platforms, diffuse bulbs, and platform lips. Platforms would have been carefully prepared. The Locus A/R extension seems to contain such debitage.
Yes
No

FS 1253, Fire Creek, Locus A/R, Stage IV stemmed point preforms. Note the long thinning flakes cross the midline of the preform. At this stage the blade and hafting element will be shaped to just about their final form. Note the severe reduction in blade thickness.

Is the stage biface/preform a Stage V finished stemmed point? (analyzed with projectile points, not tools). The final point will exhibit excellent symmetry and will have regularly spaced collateral flake scars. I am not sure at this point if we need to make "pressure flaking" a necessary attribute as I believe these points can be finished with billet and/or hammerstone without the need for pressure flaking. Steps such as distal edge/basal grinding occur in this stage. One aspect we also need to pay attention to is basal truncation (Eren, et al. 2011). This may have been done for hafting purposes. You should also note whether or not a portion of the original flake blank platform has been preserved on either end of the stemmed point. This occurs on a few specimens at Fire Creek. If you think you have a Stage V, please bring it to the attention of the lab supervisor.
Yes
No

FS 1139, Locus A/R, Fire Creek (left). This point is essentially finished and displays excellent symmetry. The missing gap at top left is from trampling. The point appears to be finished without pressure flaking. Final flaking focused on reduction of edge sinuosity. Right: The basal symmetry is likely finished in this phase. The base of the stem may be deliberately truncated for hafting. Such should be noted in your comments.

Finished point from Fire Creek, Locus A/R, CG1, test unit 2. Note the reduction of edge sinuosity. This point was likely pressure flaked in the final stage and it was clearly edge ground.

CORE DATA

CORTEX: Estimate the amount of cortex remaining on the specimen. If you are not sure if the surface is cortical see lab supervisor.

Absent. Complete tool with no cortex.
1-25%. Complete tool with 1-25% cortex.
26-50%. Complete tool with 26-50% cortex.
51-75%. Complete tool with 51-75% cortex.
76-100%. Complete tool with 76-100% cortex.
Incomplete with Cortex. Incomplete tool fragment that has any amount of cortex.
Incomplete without Cortex. Incomplete tool fragment that has no cortex.
Indeterminate. Use only if you are unsure if the tool has cortex or not.

CORE TYPE: Select the appropriate core type described below, based on its recorded attributes and overall morphology. If you think none of the core types below match your specimen, talk to a lab manager about adding a new core type.

NOTE: We no longer use "combination tool" as a core type. Instead, if you have a combination tool (e.g., core/hammerstone, etc), input the core type as the primary tool type in the ToolType1 slot, and the secondary tool type in the ToolType2 slot.

Core fragment. A fragment of a core that exhibits more than two flake scars but no initiation points. i.e. large "shatter" that has core characteristics.

Core (generic). Any pebble, cobble, chunk, etc. typically bearing three or more flake scars restricted to the margins of the raw material. **This category is used to enter those cores that cannot be placed into a more specific core type (below)**, but ***do not fit*** into the description for an exhausted core.

Assayed/Tested Raw Material. Any pebble, cobble, or other chunk bearing only one to three flake scars.

Unidirectional Core. An identifiable core with flakes removed from only one direction. Note: if the core exhibits circumferential flake scars, please enter as hemispherical core and not unidirectional core.

Unidirectional/Hemispherical Core Type A. These cores have a slightly concave surface with unidirectional flake removal in a somewhat hemispherical manner or that was clearly the intent based on almost circumferential scars. They often are made from split cobbles. Flakes are removed only in a unidirectional manner downwards from the surface. They form a roughly hemispherical shape.

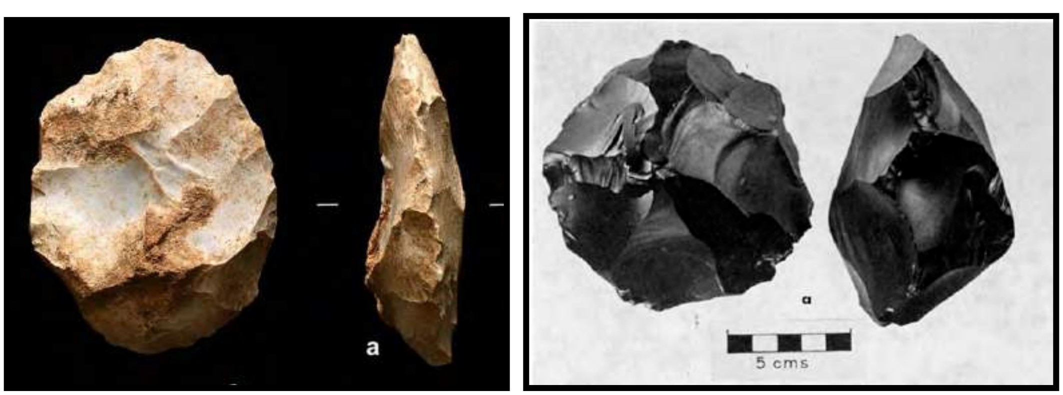
This core (FS 47, Locus A/R, Fire Creek) was likely made from a split cobble. The flakes are unidirectional (arrow) and fairly hemispherical. Note that the upper surface is concave. From a biface production perspective, this core would be inferior as the concavity would need to be removed. For the production of usable flakes this core is ok. The reason we split these cores apart is it will be interesting to see which types are more frequent (more rejected in the record).

Unidirectional/Hemispherical Core Type B. These cores have a flat or slightly convex surface with unidirectional flake removal in a somewhat hemispherical manner—or that was clearly the intent based on almost circumferential scars. They often are made from split cobbles. Flakes are removed only in a unidirectional manner downwards from the surface. They form a roughly hemispherical shape.

Locus A/R, FS 221, Fire Creek. An example of a unidirectional-fairly hemispherical core with a convex surface.

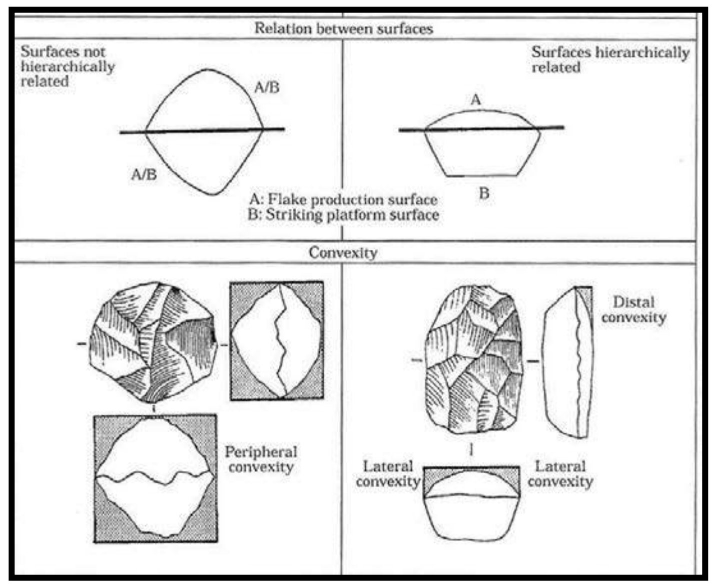
Multi-Directional Core. A core bearing flake scars removed from **three** or more directions. These represent the adhoc removal of flakes based on platform availability rather than an attempt to produce a core with a specific shape.

Discoidal Core. Bi-convex, disk-shaped core with flakes removed from both faces. It is often difficult to distinguish discoidal cores from early stage bifaces (see below) since lithic analysts cannot always perceive what the flintknapper intended to manufacture. Crabtree does not make a clear distinction; therefore, a somewhat arbitrary distinction will be made based upon the size of the cobble and our interpretation of the flaking pattern as intended to produce flakes or a specific morphology. The discoidal core is defined as a thick cobble exhibiting large flake scars on both faces. The core is biconvex in cross-section and the flake scars are large, representing the detachment of flakes suitable for manufacture into tools, then the specimen will be designated a discoidal core. We expect to see lab notes discussing this issue based on your experiences and observations.



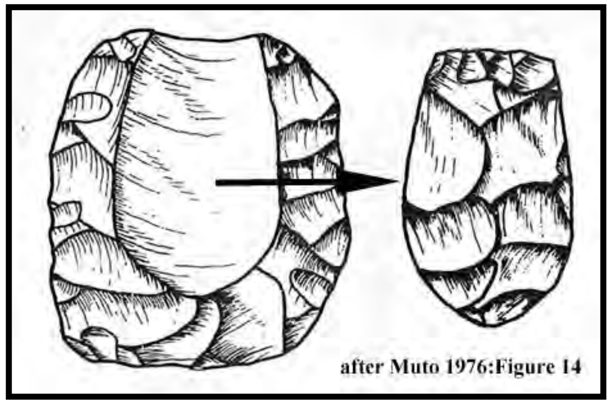
Two examples of discoidal cores. The core to the left is from the Topper site (from Collins 1999:Figure 11). The core on the right was made by Don Crabtree (from Crabtree 1968:Figure 5). See comparison with Levallois in below illustration.

Tortoise Core/Levallois-like (Type A) Core with no Levallois-like Flake Detachment. Semi-plano-convex cross section as opposed to a discoidal core, which has more bilateral symmetry in cross-section, used for the manufacture of large flake blanks including the detachment of a Levallois-like flake. Flaking pattern should be designed to produce a central ridge from which a Levallois-like flake can be detached. This category is for coding those Levallois-like cores that have not had the detachment of one or more Levallois-like flakes. Crabtree (1972:73) illustrates such a core. Please note if there has been an attempt to isolate a platform and create a central ridge. The technique we see in the New World is referred to as "Levallois-like" as Levallois refers to an Old World Tradition. The distinction between general discoidal core reduction and Levallois is made in the below illustration.

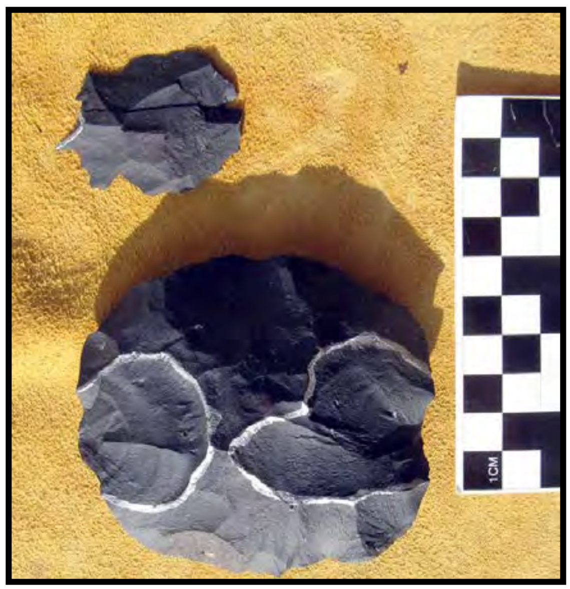


FS 475 Locus A/R, Levallois-like core without flake removal (left). Arrow indicates location of platform and central ridge. Comparison of the discoidal core with the Levallois core (right) (after Wiseman, et al. 1994:Figure 178).

Levallois-like Core (Type B) with Levallois-like Flake Detached. A Levallois-like core bearing the flake scars indicating the removal of a Levallois-like flake.

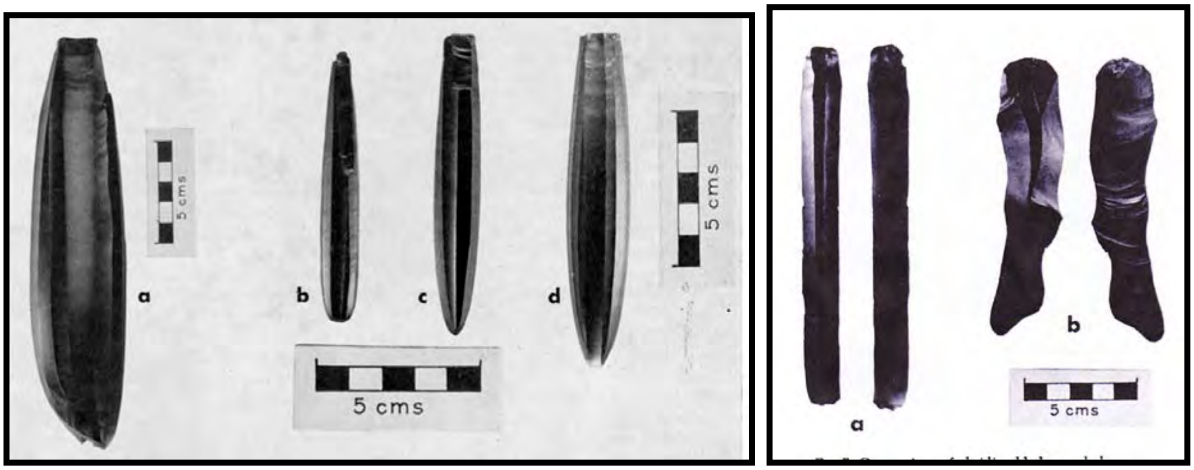


FS 1377 Locus A/R Fire Creek, example of Levallois-like core with primary flake removal (left). The flake was an overshot and the core is about spent. The technique is illustrated (right). Typically Levallois flake platforms are carefully prepared and isolated before detachment with hard hammer. Please carefully note any platform preparation or isolation.



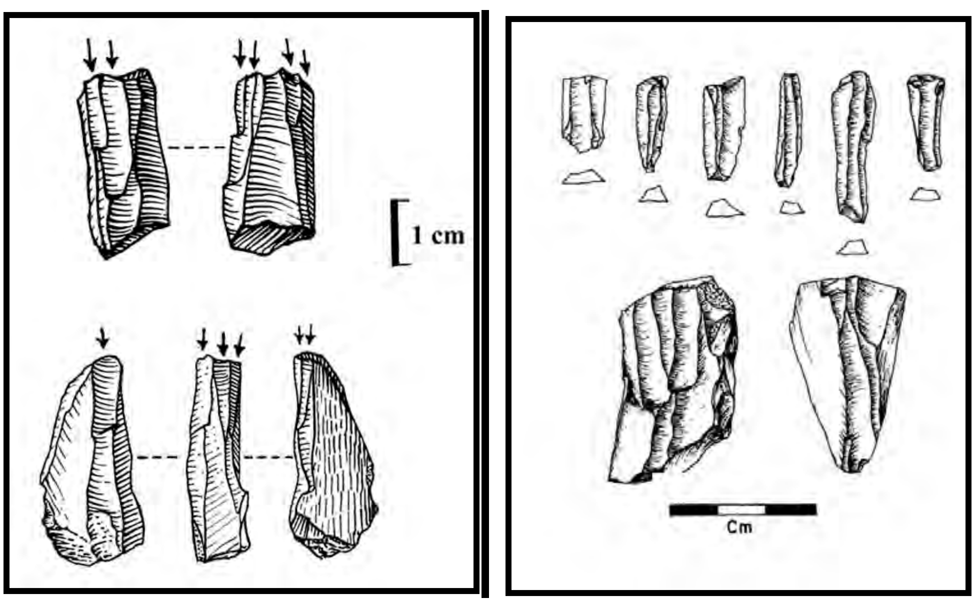
Experimental Levallois-like core establishment of central ridge (left) and failed "siret" Levallois-like flake detachment that split longitudinally (top).

Polyhedral Core. This is a formal core type used for the manufacture of prismatic or trapezoidal blades. The core is cylindrical in shape with associated prismatic blade scars. A core with blades removed by pressure is illustrated below and in Crabtree (1972:43, 46, 55). Blades can also be removed via percussion.



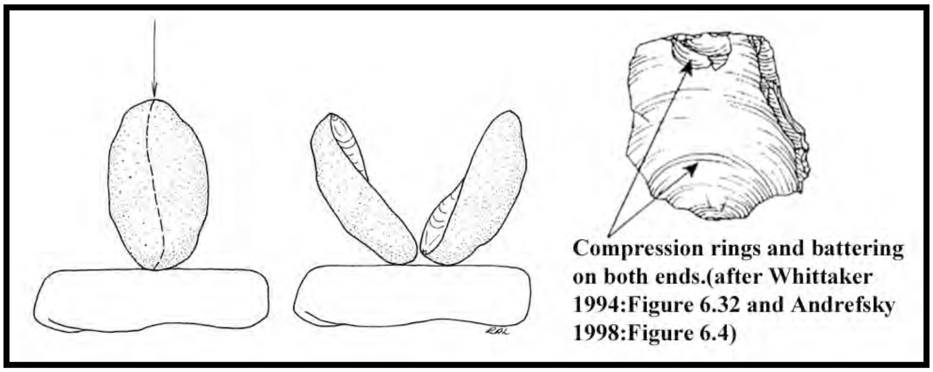
Examples of prehistoric polyhedral blade cores from Mexico (from Crabtree 1968:Figure 1 and 7).

Bladelet/Microblade Core. Small irregular or wedge-shaped microblade/bladelet cores. These cores will have the removal of one or more microblades in either a multidirectional, bidirectional or unidirectional manner.



Bladelet/microblade cores from the Channel Islands (after Green 1955:Figure 2) (left) and bladelet/microblades and cores from the same general location (from Hart 1983:Figure 2) (right).

Bipolar Core. Cobbles are often split by the bipolar method. The cobble is set upon a hard surface (anvil) and struck with a hammerstone. The technique can also be used to split other objective pieces/flakes. The technique is identified by percussion damage on opposing ends of the object struck. Compression rings will sometimes be visible emanating from both ends of the piece. Bulbs of percussion are typically not formed in bipolar reduction.



An example of the bipolar technique and resulting "orange peel" split and compression rings (after Andrefsky 1998; Whittaker 1995:Figure 6.32).

IS THE CORE EXHAUSTED? For our purposes an exhausted core is arbitrarily designated a core that is under 5 cm in maximum dimension.

Yes
No

Regarding Measuring Cores. We will be measuring the maximum linear dimension to the nearest 1 mm.

Core Size Value. This is the maximum linear dimension multiplied by the weight. You do not need to calculate this statistic; it will be done automatically in the database.

Core Size Rank. This is the core size value, relative to all other cores. You do not need to calculate this statistic; it will be done automatically in the database.

FLAKE TOOL DATA

NOTE: The flake tool analysis and flake types are the same as from the Phase III: Debitage Analysis Manual. Please refer to that manual or the Biface Manual for more detailed descriptions and photos/images.

CORTEX:

Absent.
Some Cortex (1 to 99%).
All Cortex (100%).
Incomplete tool with Cortex.
Incomplete tool without Cortex.
Indeterminate.

DOES THE FLAKE TOOL EXHIBIT A SIRET BREAK?

Yes. (should be entered as complete if platform present)
No
Indeterminate/Not applicable. (all non-flake tools**)**

DOES THE TOOL EXHIBIT EVIDENCE FOR A RADIAL BREAK?

Yes. (if platform present, should be entered as complete flake, if not then incomplete)
No.
Indeterminate.

DOES THE TOOL EXHIBIT EVIDENCE FOR INTENTIONAL BREAKAGE?

Yes.
No.
Indeterminate. (use sparingly)

PLATFORM TYPE:

Absent.
Single Facet Non Cortical.
Cortical.
Multi-faceted.
Ground/Abraded.
Indeterminate. Use sparingly.

DOES THE PLATFORM SHOW EVIDENCE FOR CRUSHING/STEPPING?

Yes.
No.
Indeterminate. (This can be used for incomplete flake tools)

IS THE PLATFORM ISOLATED?

Yes.
No.
Indeterminate. (This can be used for incomplete flake tools)

IS THE PLATFORM SITUATED ON A RIDGE?

Yes.
No.
Indeterminate. (This can be used for incomplete flake tools)

LIP:

- **Absent.**
- **Lip 1.**
- **Lip 2.**
- **No.**

BULB OF APPLIED FORCE:

- **Absent.**
- **Prominent.**
- **Diffuse.**
- **Indeterminate.** (Use sparingly)

TERMINATION:

- **Feather**
- **Hinge/Step/Reverse Hinge**
- **Outrepassé**
- **Material Flaw**
- **Multiple Steps**
- **Indeterminate** (Use sparingly)

FLAKE TYPE:

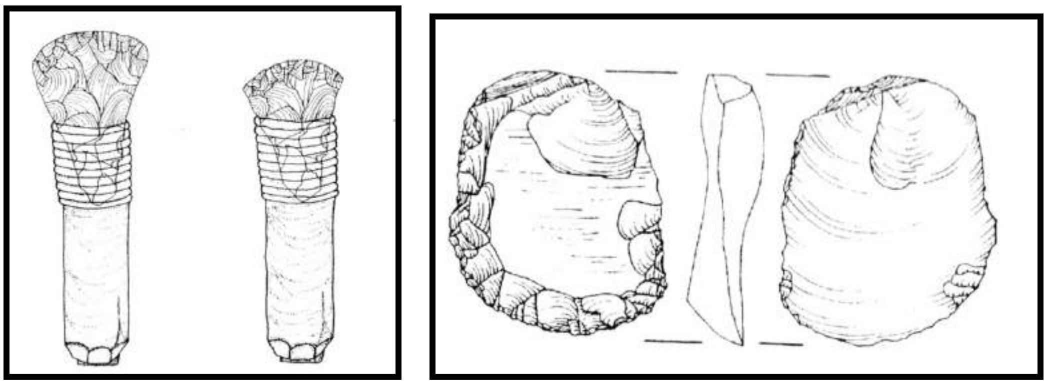
- **Edge Trimming Flake**
- **Biface Thinning Flake**
- **Core Reduction Flake**
- **Blade-like Flake or "Adhoc Blade"**
- **Prismatic/Trapezoidal Blade (percussion or pressure)**
- **Crested Blade**
- **Side Struck Flake**
- **Biface or Generic Outrepassé Flake**
- **Core Platform Rejuvenation or "Tablet" Flake**
- **Initial Levallois-like Flake**
- **Secondary Levallois-like Flake**
- **"A" Blade**
- **Bipolar Flake or Blades: (citrus flake, tangerine flake)**
- **Error Recovery Flake**
- **Hammerstone Spall**
- **Burin Spall**
- **Errailure Flake**
- **Pressure Flake**
- **Notching Flake**
- **Channel/Flute Flake**
- **Edge Bite Flake**
- **Indeterminate Technological Flake**

FLAKE TOOL TYPE: Select the appropriate flake tool type described below, based on its recorded attributes and overall morphology. If you think none of the tool types below match your specimen, talk to a lab manager about adding a new tool type.

NOTE: We no longer use "combination tool" as a flake tool type. Instead, if you have a combination tool (e.g., scraper/graver, etc), input the primary tool type in the ToolType1 slot, and the secondary tool type in the ToolType2 slot. Primary versus secondary tool types can be distinguished on the basis of which covers a larger area on the tool, or which appears to be used more intensively.

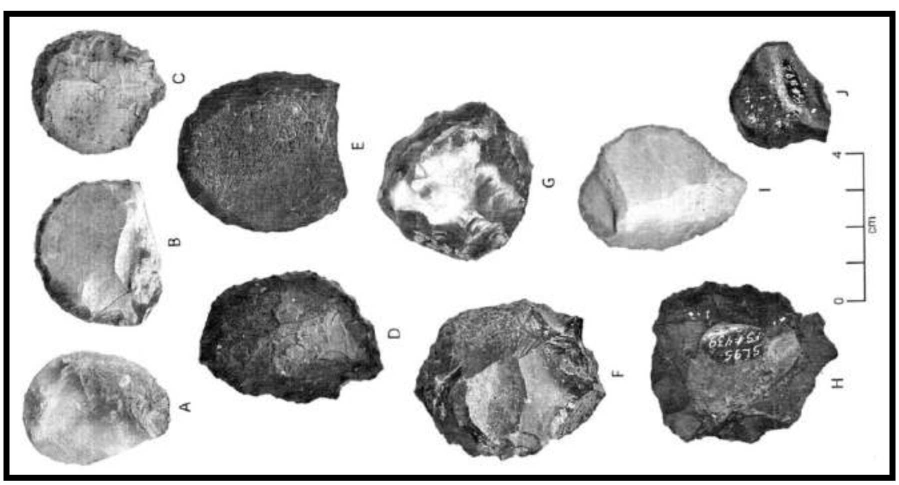
Scraper Fragment. A fragment that possesses a steeply beveled edge produced by unifacial flaking and unifacial use-wear. These fragments are too small to determine scraper type.

End Scraper. A tool with a unifacially flaked, steeply beveled edge(s) with use-wear. An end-scraper is defined as a scraper with only one end (usually distal, but could be proximal end) that has been modified into a scraper. The end is typically convex in shape. In your notes, you should mention whether or not the scraper's morphology would be conducive to hafting.



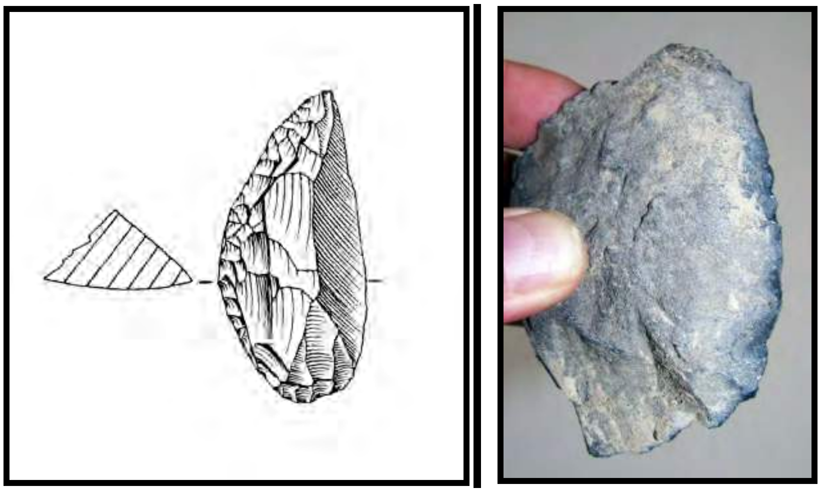
Typical end scrapers (from Andrefsky 1998:Figures 2.17 and 7.23). The left image illustrates resharpening and reduction of the tool size.

Circular Scraper. These are end scrapers that have been retouched along all edges and have a fairly round or oval form. Examples from the Sunshine Locality are shown below.



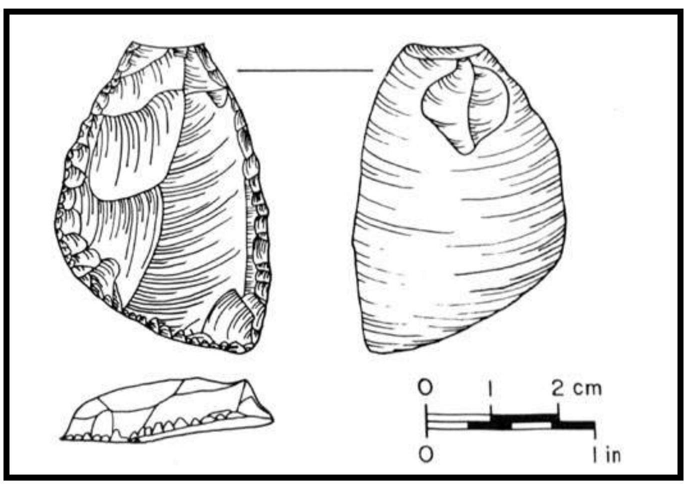
Examples of circular scrapers from the Sunshine Locality (from Beck and Jones 2009:Figure 5.23).

Side Scraper. A scraper with one or both sides modified by steep angled retouch and use-wear.



Side-scrapers (from Inizan, et al. 1999:Figure 34) (left) and Fire Creek, Locus A/R, FS 634 (right).

End and Side Scraper. A scraper with side(s) and end(s) exhibiting steep angled retouch and use-wear.

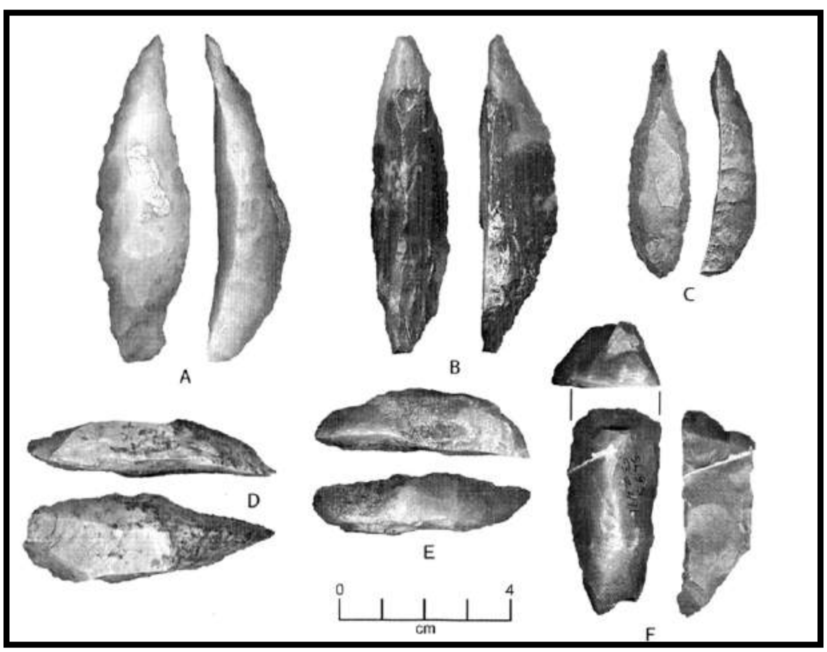


An example of an end and side scraper (from Whittaker 1995:Figure 6.35).

Concave Scraper. This tool consists of a scraper modified by deliberate retouch and perhaps use so that one edge has a distinct/deep concavity. Traditionally these scraping implements have been termed "spokeshaves," which implies woodworking. However, we are not assuming the tool was used for woodworking. An example is below. If the concavity is small (**around 1 cm**) and more resembles a "notch", please enter as "notched flake" below.

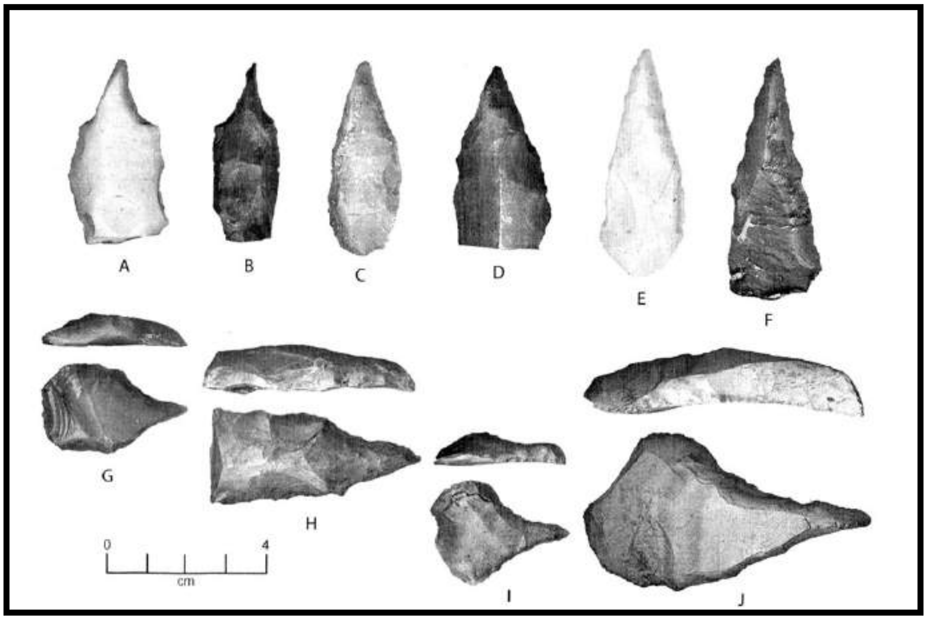
FS 1140, Locus A/R, Fire Creek. A broken biface modified into a concave scraper.

Slug Scraper. These tools are also known as "limaces" (Gramly 1982). Bordes defines these as being blades that are retouched to form a slug shape (Bordes 1968:245). Our definition will include flakes or blades that are retouched into a "slug" or bipoint shape with unifacial retouch. Examples from the Sunshine Locality in Nevada are shown below. The Sunshine Locality slug scrapers (see below) tend to have a very pointed end(Beck and Jones 2009:Figure 5.25).

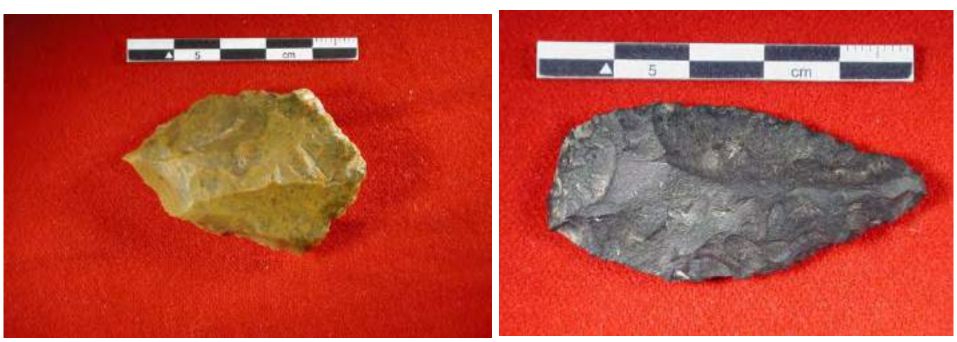


Slug scrapers from the Sunshine Locality (from Beck and Jones 2009:Figure 5.25).

Beaked Scraper. These tools have been variously named narrow end scrapers, chisel-gravers, groovers, awls, and beaks (Beck and Jones 2009:129). We will utilize Beck and Jones (Beck and Jones 2009:129) definition which includes those tools that have a "…cutting or scraping tip which is plano-convex in cross-section, usually steeply retouched and frequently quite thick, hence the term beaked." Examples from the Sunshine Locality are below. Consult with a lab supervisor before using this category.



Examples of beaked scrapers (from Beck and Jones 2009:Figure 5.26).



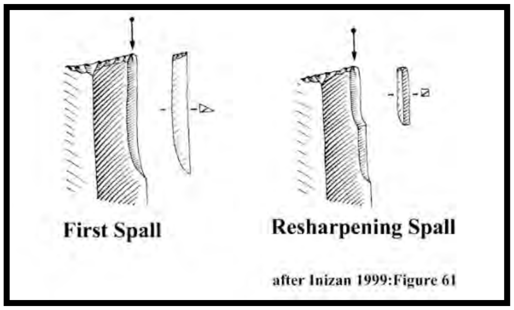
Example of a "beaked scraper" (left) and slug scraper (right) from Fire Creek, Locus S.

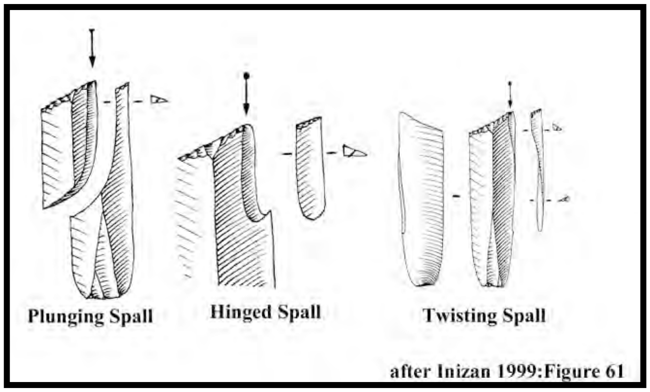
Pebble Scraper. This tool consists of a pebble (not a flake) with one or more steep unifacial edges with use-wear.

Elongate Scraper. This type is narrow and bipoint in shape with a central ridge. One or both of the edges are steeply worked and can be denticulated by flaking. Two examples are below. Consult with a lab supervisor before using this category.

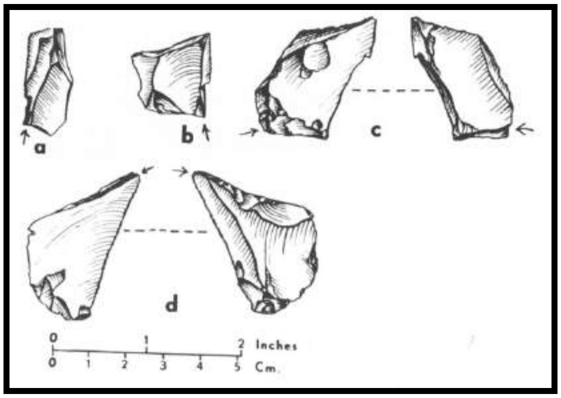
Elongate scrapers from Fire Creek, Locus S (shot 970, FS 388) (left) and 507N/500E FS 2 (right).

Burin. A tool that exhibits the removal of a deliberate "burin spall(s)" by either percussion or pressure. The goal of the spall removal is to produce a strong, sharp edge, probably used for graving activities. Both the sharp edge on the burin and the "burin spall" often become tools. Consult with a lab supervisor before using this category.





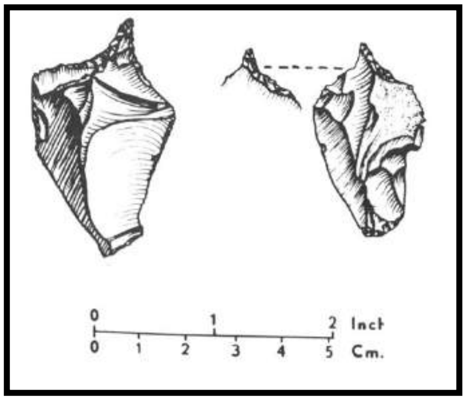
Examples of burins and spall morphology (after Inizan, et al. 1999:Figure 61).



Bradley and Frison describe "a" and "b" as typical and "c" and "d" as atypical burins (after Frison and Bradley 1980:Figure 44).

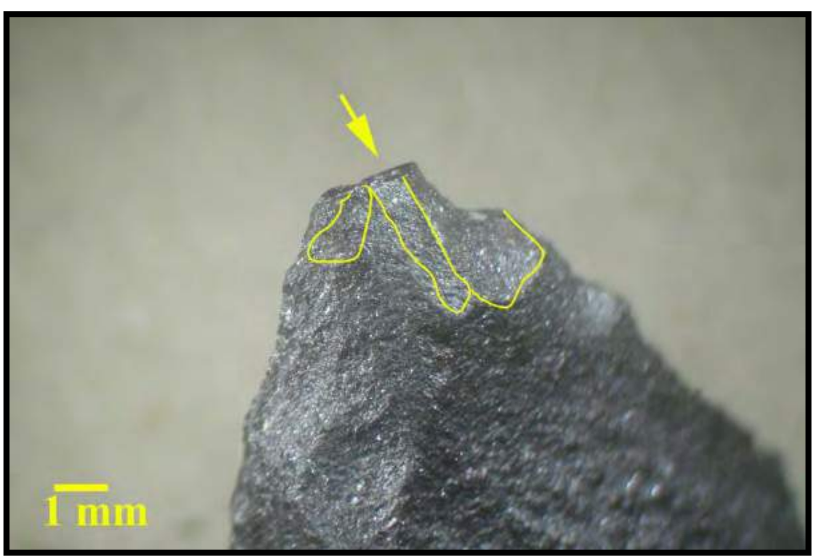
Graver (Single Created Projection). These tools are made from a flake or blade and have a single projection that has been created by **deliberate flaking**. If there is a projection that was not created—evaluate if the wear pattern is indicative of drilling or graving/scraping and use either informal drill or informal graver categories below. Typically the retouch is unifacial (Gramly

1990:26). They may have been formed by unifacial retouch on one or both sides of the projection. They have been identified in the literature as graving spurs, piercers, and perforators (Beck and Jones 2009:126). The projection may be broken from use. We are separating gravers from informal drills by use-wear pattern. Gravers are defined as typically having small unifacial edge attrition and/or rounding at the tip of the projection from use in a transverse motion (like a scraper). If the tip of the "graver" exhibits torsion fractures (small fractures oriented primarily perpendicular to the axis of the tip) then enter the piece as an informal flake drill (below).



Gravers from the Hanson Site (from Frison and Bradley 1980:Figure 45) (left). A typical Fire Creek graver (right).

Graver (Single Non-Created Projection). This category is for flakes with a projection(s) that have been used in a graving/scraping motion (not drilling) but it is clear that the projection itself was not deliberately fashioned. An example of a characteristic "graving" wear pattern is shown below.

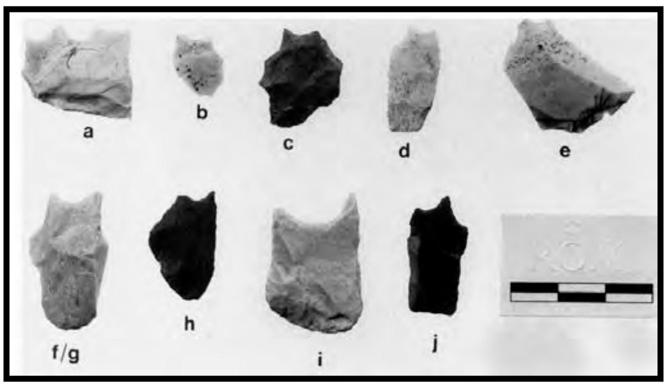


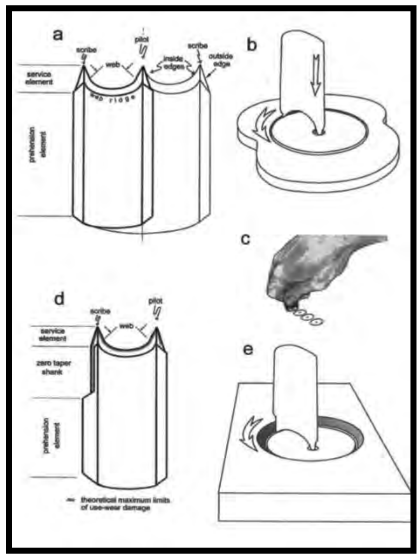
Use-wear created flake scars on the tip of an experimental graver.

The artifact referred to by Frison and Bradley as atypical burins will be considered as a graver on a non-created projection. These tools were thought to have been produced deliberately by radially breaking bifaces (see Frison and Bradley 1980:71, 97-98). "Siret" breaks (when a flake breaks longitudinally) were also commonly thought to be burins in the Old World. This idea has largely been discredited (Inizan, et al. 1999:156). However, this category is maintained to allow entry in the database of very atypical burins which must show clear evidence of use-wear

Graver (Multiple Projections). This category is used for gravers with multiple retouched projections that do not fit the description of "compass graver" as defined below.

Compass/Coring Graver. Compass/Coring gravers exhibit two manufactured projections on the same margin. These tools may have been used to groove/scribe and core in a manner depicted below and have recently been identified at a number of Paleoindian sites (Tunnell 1978).





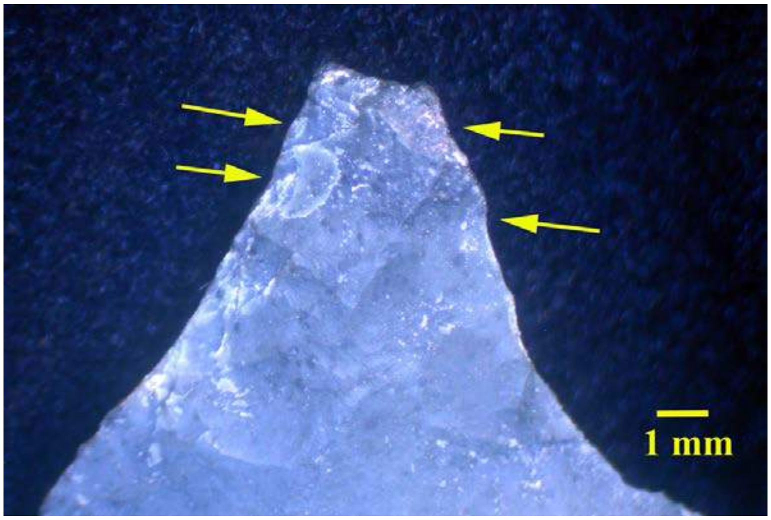
Examples of compass/coring gravers and there probable use (after Tunnell 1978:Figures 2 and 5).

Informal Flake Drill Type A (Utilized Created Projection). This tool type is a specific form of utilized flake that we infer was used as an expedient drill or at least the tip of the flake exhibits use-wear indicative of the flake being used in a drilling manner. The tip also shows evidence of deliberate modification to create or sharpen the projection. If the projection has clearly been created by deliberate breakage, then use this tool designation. Many of these tools were present at Fire Creek. They are typically made from a flake or blade with a natural projection that is triangular in cross section, but has also been modified. If the projection shows use-wear only, then enter as the below tool type. Often these tools will have considerable prehensile wear (see Odell and Odell-Vereecken 1980; Rots 2004) on the lateral edges of the drill tip. Examples are shown below. Note: you have the opportunity to record if more than just the projection is utilized below in the "use-wear" section. If a lateral edge is utilized as well as the projection, then select a second tool type in the ToolType2 slot.

Two probable informal drills from Fire Creek with broken projections. Note the probable prehensile wear on the flake lateral edges on the drill on the left (FS 1432).

Informal Flake Drill Type B (Utilized Non-Created Projection). This tool type is a specific form of utilized flake that we infer was used as an expedient drill or at least the tip of the flake exhibits use-wear indicative of a rotary motion. This type differs from the type above in that the tip does not show evidence for deliberate creation/modification to form the projection, but likely occurs on an opportunistic projection. Note: you have the opportunity to record if more than just the projection is utilized below in the "use-wear" section. If a lateral edge is utilized as well as the projection, then select a second tool type in the ToolType2 slot. An example of the characteristic wear pattern is shown below.

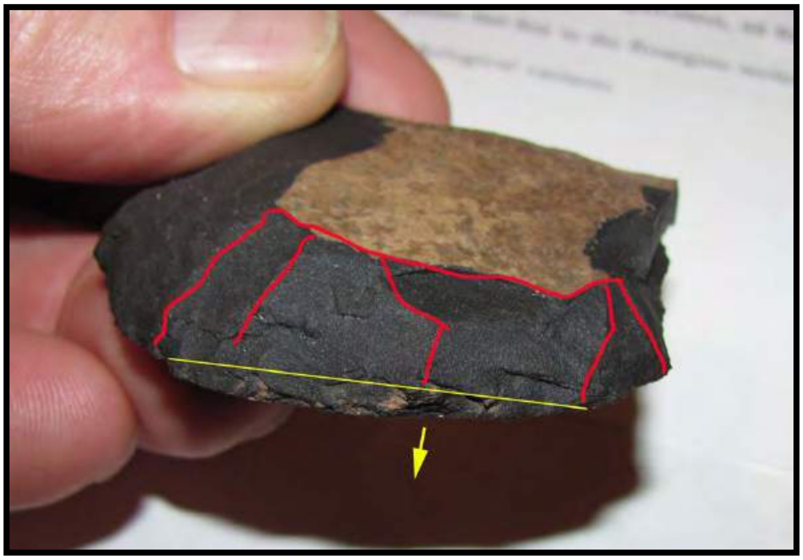
An experimental informal flake drill with subtle distal wear pattern created from drilling holes in hardwood.



This flake edge was used to drill bone beads for 28 minutes. Note the distinct "torsion" flaking pattern. Often, but not always, some rounding can be seen at the top of the projection.

Perforator/Awl. This is a tool with a long projection not necessarily shaped by percussion or pressure flaking. It should not exhibit the torsion scars present on flake drills, but may have polish or damage on the tip only as it was likely used to punch or perforate soft materials, not to grave/bore through hard materials like a graver. Ask a lab manager before using this category.

Retouched Flake. A flake which has had one or more of its edges intentionally modified by the removal of small flakes by either percussion or pressure methods for the purposes of blunting, sharpening, or shaping (Odell 2004: 64-65). Retouch tends to be larger than use-wear, more invasive and more regularly spaced along the edge. Generally the edge is crushed at the point of impact or pressure (Odell and Odell-Vereecken 1980:86). Retouch generally but not always, consists of flake removals greater 2 mm.

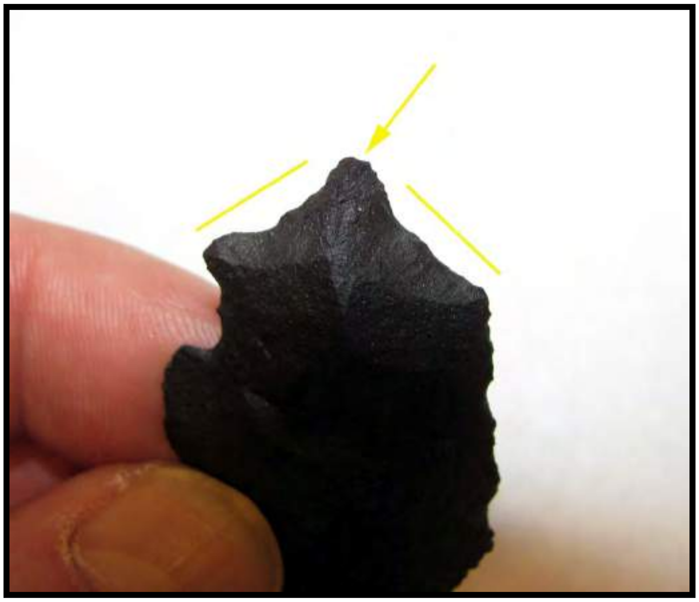


Use-wear attrition is generally located within 1-2 mm of the edge, but this is very dependent on many factors including material type, force used, edge angle, etc. The area below the yellow line contains step fractures related both to flaking events and from scraping hardwood. Deliberate retouch on this experimental end scraper is shown in red.

Utilized Flake. A flake which has not been formally modified, but one or more edges have been utilized. Use-wear is defined as incidental flake removals with a greatest dimension generally less than 2 mm or with other evidence for use (crushing, hinging, blunting, grinding, smoothing, polish, faceting, battering). Note: tools with triangular projections and use-wear on those projections should probably be entered as a graver or flake drill above.

Right Image: Subtle edge damage (rounding, tiny scalar and snap flaking) caused from cutting the front and hind legs off a deer, cutting backstraps off, and considerable bone contact. Experimental tool 2012-#249, Geoff type collection. Left Image: Edge damage (pronounced snap flaking, edge failure) caused from sawing a fresh deer leg bone in half to produce two awl/knife preforms.

Retouched and Utilized Flake. A flake which exhibits both deliberate edge modification and use-wear. If retouch is steep-angled and continuous with use-wear, enter as appropriate scraper type.

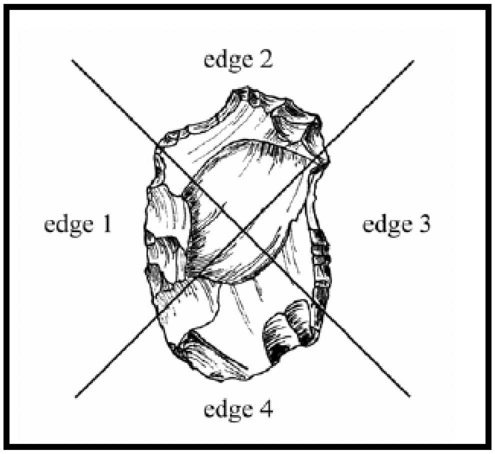


An experimental graver/gouge/chisel edge (exp. Tool 2012-#254, Geoff type collection). The edge was manufactured by pressure flaking retouch indicated by lines. The tip (arrow) was used to gouge green deer bone to initiate/facilitate sawing bone in half. The use-wear is mainly in the form of very subtle rounding and polish only observable at high magnification. The right lateral margin was used to saw the bone and use-wear is much more pronounced (large snap flakes). Because a projection was formally constructed and used, this would be considered a graver and not a retouched/utilized flake.

Notched Flake. This is a flake with a distinctive small notch caused by either use and/or unifacial or bifacial deliberate notching and/or a combination of both. If the notch is larger than approximately 10 mm, it should probably be entered as concave scraper.

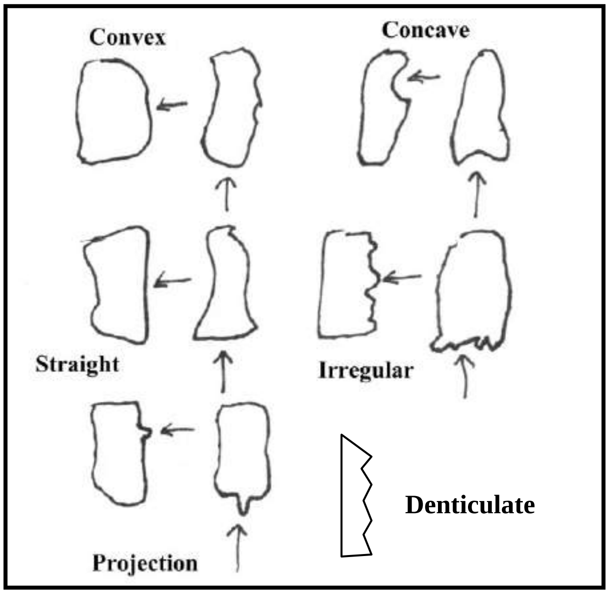
Chopper. A heavy tool that was used for chopping and generally exhibits a bifacial edge with large step flakes and use-wear. It is OK if the chopper is not made on a flake, just record the appropriate attributes below. If you think specimen is a quarry tool rather than a chopper, please inform a lab manager and note in your comments.

NUMBER OF MODIFIED/USED FLAKE TOOL EDGES: Record the number of edges (proximal, distal, lateral, lateral) that appear to have either been utilized and/or retouched. There are only four edges in this scheme.



TOOL EDGE MORPHOLOGY PLANVIEW (NOT CROSS SECTION): Choose the best descriptor of the area of *PRIMARY TOOL USE (IF YOU SELECTED TWO TOOL TYPES THIS THE ONE THAT YOU LISTED FIRST).* You are trying to describe the overall general morphology of the **primary** area of tool use.

Convex
Concave
Straight
Irregular
Projection(s)
Denticulate
Indeterminate



DOES THE TOOL EXHIBIT USE-WEAR? If so pick the best descriptor below. Please go over what constitutes trampling damage, pronounced use-wear with Geoff. There are also examples of polish formation on tools in the type collection.

Absent. There is no evident use-wear.
Pronounced with Good Integrity. The tool has pronounced use-wear in the form of ***very*** visible (no magnification), patterned attrition scars along one or more margins. The patterns are regular enough not to be confused with trampling.
Subtle with Good Integrity. The tool has subtle use-wear attrition along one or more edges. This would include very small edge scarring that requires a hand lens to observe.
Possible Use-Wear but Compromised. Possible use-wear pattern(s) is apparent, but the tool also exhibits evidence, in the form of sharp edge breaks, that could be interpreted as trampling or other post-depositional modifications. These are tools that should not be selected for use-wear study.
Indeterminate.

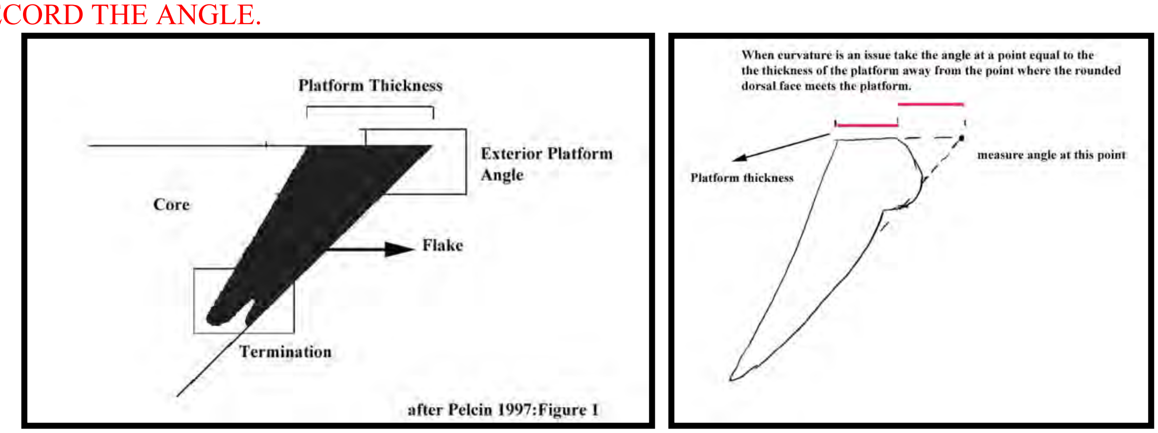
DOES THE APPARENT UTILIZED EDGE EXHIBIT EVIDENCE FOR POLISH FORMATION AND/OR STRIATIONS? Take a quick look at the tool under a light with your hand lens.

Yes. There is a reflective band, spot, or other area of polish. Be careful to not be fooled by oil/moisture from fingers. What we are looking for here are discrete areas that are polished NOT ubiquitous polish along an edge.
No. There is no evidence for any areas on the tool edge that are polished.

DIMENSIONS/METRICS

Dimensions are measured only with digital calipers to the nearest tenth of a millimeter (0.1), and the nearest hundredth of a gram (0.01). Occasionally you may encounter a larger tool that requires use of a larger device such as a tape or ruler. In this case, measuring to the nearest mm is acceptable. Similarly measurements of extrapolated lengths or widths of bifacial tools should be made to the nearest mm.

EXTERIOR PLATFORM ANGLE: The angle of the platform relative to the dorsal surface of the flake (Pelcin 1997: Figure 1), measured to the nearest 1 degree increment using a goniometer. Locate an area that best characterizes the angle and then take the measurement. Making an estimation to the closest degree. If the measurement is not possible or too difficult due to the flake morphology try to have a lab supervisor make the measurement with the microscope. If the measurement cannot be made then write a dash "-". Please use this category sparingly and after consultation with lab supervisor. However, if the measurement is not possible only due to a rounded or recessed morphology at the point where the dorsal face meets the platform then incorporate the method used by Dibble (1989:153) "on flakes with curved exterior surfaces, the measurement of this angle can vary depending on the point on the exterior surface at which the measure was taken. For the sake of consistency, the angle used was that formed by two lines -- one represented by the platform thickness, the other extending down the exterior face directly in line with the axis of percussion to a distance equal to the platform thickness." This is illustrated below. Please only apply this to those flakes that have a curvature issue. If there is a true angle---measure the angle. Please see a supervisor if you have any questions. IF YOU ARE RECORDING ANGLES THAT ARE OVER 95 DEGREES THEN YOU ARE LIKELY DOING THIS WRONG. BE CAREFUL WITH MULTIFACETED PLATFORMS. IF YOU DO NOT THINK THE ANGLE IS INDICATIVE OF WHAT HAPPENED DUE TO CRUSHING, PLATFORM MODIFICATION ETC. THEN DO NOT RECORD THE ANGLE.



The above are illustrations of how to measure platform angle and thickness.

PLATFORM THICKNESS (to 0.1 mm): Please enter the maximum dimension of the platform from ventral to dorsal surface. Note that this is not the platform length. If measurement is not possible/not applicable simply write a dash "-".

LENGTH (to 0.1 mm): For bifaces, the maximum dimension from proximal to distal. For cores, measure the maximum linear dimension. For other tools where it is not possible to determine orientation, the maximum dimension of the specimen.

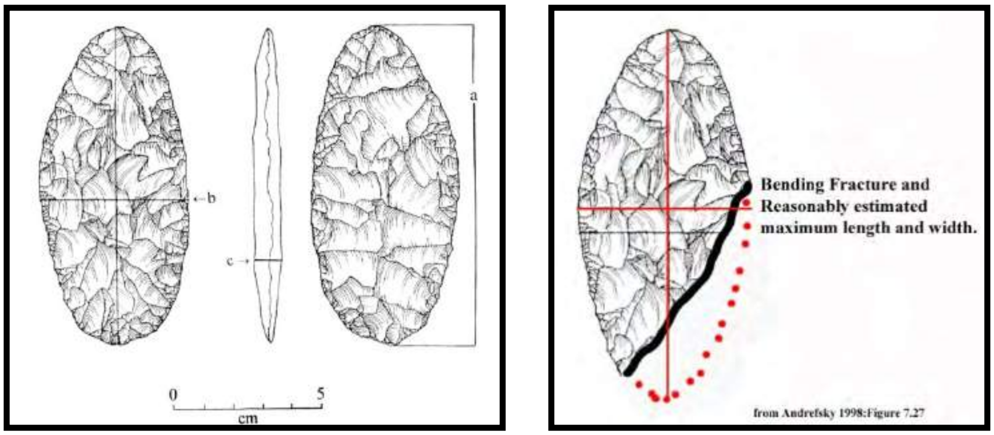
BIFACE EXTRAPOLATED LENGTH (to 1 mm): In cases where the broken biface dimensions can be reasonably extrapolated from a piece broken and not reworked, please estimate the maximum length before the tool was broken (see below illustration).

WIDTH (to 0.1 mm): The maximum distance from edge to edge perpendicular to, and in the same plane as length. Do not measure “widths” of cores.

EXTRAPOLATED WIDTH (to 1 mm): In cases where the broken biface dimensions can be reasonably extrapolated from a piece broken and not reworked, please estimate the maximum width before the tool was broken (see below illustration).

THICKNESS (to 0.1 mm): The maximum dimension at right angles to the plane in which length and width were measured. Do not measure “thickness” of cores.

WEIGHT (to 0.01 g): Weight of the specimen to the nearest 0.01 of a gram.



How to measure maximum biface dimensions (left) and reasonable estimated broken biface dimensions.

BIFACE EDGE ANGLE 1: In order to help identify stages in the biface reduction sequence(s), we are recording the angle at which the two faces of a biface intersect as per Callahan (2010). Angles are recorded to the nearest 1 degree using a goniometer. Rather than take multiple measurements and average them. The analyst should hold the biface up and examine the cross section with the aid of the goniometer to determine the best estimated angle for one edge. This can also be done in concert with Callahan’s angle chart.

BIFACE EDGE ANGLE 2: The edge angle of the other side determined as above.

SCRAPER EDGE ANGLE: Record the angle to the nearest 1 degree using the goniometer. If there are multiple edges, record the approximate angle of the edge that encompasses the most area and best generalizes the overall edge angle.

AREA OF THE BIFACE AS DETERMINED BY IMAGE J SOFTWARE: Enter area in square cm or enter a dash “-“ if this measurement was not taken at this time.

JOHNSON THINNING INDEX: This is an alternative to biface stage classification developed by Johnson (Bement 1991) and recently applied by Beck and Jones to Paleoarchaic biface analysis (Beck, et al. 2002). The index has two major advantages in that it helps remove subjectivity from an assessment of biface stage analysis and it can be calculated on fragmentary bifaces. The index is a ratio of weight to plan view area (WEIGHT/AREA). The plan view area can be calculated manually or by the aid of computer morphometric analysis. We have not yet determined how our sample will be calculated.

Enter ratio or enter a dash “-“ if this measurement was not taken at this time.

COMMENTS: All important characteristics that are not specifically recorded by drop down choices should be described here along with any observations you feel are important.

REFERENCES CITED

Andrefsky, Jr., William
1998 Lithics: Macroscopic Approaches to Analysis. Cambridge: Cambridge University Press.

Beck, Charlotte, and George T. Jones
2009 The Archaeology of the Eastern Nevada Paleoarchaic, Part I The Sunshine Locality. Salt Lake: The University of Utah Press.

Beck, Charlotte, et al.
2002 Rocks are heavy: transport costs and Paleoarchaic quarry behavior in the Great Basin. Journal of Anthropological Archaeology 21(4):481-507.

Bement, Leland C.
1991 The Thunder Valley Burial Cache: Group Investment in a Central Texas Sinkhole Cemetery. Plains Anthropologist 36(135):97-109.

Bleed, Peter, and Marlene Meier
1980 An Objective Test of the Effects of Heat Treatment of Flakeable Stone. American Antiquity 45(3):502-507.

Bordes, Francois Henri
1968 The Old Stone Age. London: World University Library.

Buenger, Brent A.
The impact of wildland and prescribed fire on archaeological resources, Anthropology, University of Kansas.

Callahan, Errett
2000 The Basics of Biface Knapping in the Eastern Fluted Point Tradition. Lynchburg: Piltdown Productions.

Collins, Michael B.
1999 Clovis Blade Technology. Austin: University of Texas Press.

Cotterell, Brian, and Johan Kamminga
1987 The Formation of Flakes. American Antiquity 52:675-708.

Crabtree, Don E.
1968 Mesoamerican Polyhedral Cores and Prismatic Blades. American Antiquity 33(4):446-478.

Crabtree, Donald E.
1972 An Introduction to Flintworking. Pocatello: Idaho State University Museum.

Domanski, Marian, and John A. Webb
1992 Effect of Heat Treatment on Siliceous Rocks Used in Prehistoric Lithic Technology. Journal and Archaeological Science 19:601-614.

Eren, Metin I., Stanley Vanderlaan, and John D. Holland
2011 Overshot Flaking at the Arc Site, Genesee County, New York: Examining the Clovis-Gainey Connection. The Open Anthropology Journal 4:40-52.

Flenniken, J. Jeffrey, and Ervan G. Garrison
1975 Thermally Altered Novaculite and Stone Tool Manufacturing Techniques. Journal of Field Archaeology 2(1/2):125-131.

Frison, George C., and Bruce A. Bradley
1980 Folsom Tools and Technology at the Hanson Site, Wyoming. Albuquerque: University of New Mexico Press.

Gramly, Richard Michael
1982 The Vail Site: A Palaeo-Indian Encampment in Maine. Buffalo: Bulletin of the Buffalo Society of Natural Sciences Volume 30.

—
1990 Guide to the Palaeo-Indian Artifacts of North America. Buffalo: Persimmon Press.

Green, Joe H.
1955 Some Flint Caches, the Alibates Quarry, and the Stone Pestle. Panhandle-Plains Historical Review 28:78-81.

Griffiths, D.R., et al.

1987 Experimental Investigation of the Heat Treatment of Flint. *In* The Human Uses of Flint and Chert, Proceedings of the Fourth International Flint Symposium Held at Brighton Polytechnic 10-15 April 1983. G.d.G. Sieveking and M.H. Newcomer, eds. Pp. 44-52. Cambridge: University of Cambridge Press.

Hart, Alyce
1983 Eleven Caches from Near Lamesa, Texas. *In* Transactions of the 18th Regional Archaeological Symposium for Southwestern New Mexico and Western Texas. Midland: Midland Archaeological Society.

Hartwell, William T.
1995 The Ryan's site cache: comparisons and plainvew. The Plains Anthropologist 40(152):165-184.

Hofman, Jack L., Lawrence C. Todd, and Michael B. Collins
1991 Identification of Central Texas Edwards Chert at the Folsom and Lindenmeier Sites. Plains Anthropologist 36(137):197-308.

Industries, Raytech
1965 The Story of Fluorescence. Stafford Springs, Connecticut: Raytech Industries.

Inizan, Marie-Louise, et al.
1999 Technology and Terminology of Knapped Stone. J. Féblot-Augustins, transl. Nanterre Cedex Cercle de Recherches et d'Etudes Préhistoriques

Jennings, Thomas A.
2011 Experimental production of bending and radial flake fractures and implications for lithic technologies. Journal and Archaeological Science 38:3644-3651.

Miller, Michael J.
2006 An Experimental Study of Lithic Biface Manufacture: Toward Understanding the Perverse Fracture, Department of Archaeology, University of Exeter.

Odell, George H., and Frieda Odell-Vereecken
1980 Verifying the Reliability of Lithic Use-Wear Determinations by "Blind Tests": The Low Power Approach. Journal of Field Archaeology 7(1):87-120.

Patterson, Leland W.
1079 Quantitative Characteristics of Debitage from Heat Treated Chert. Plains Anthropologist 24(85):255-259.

Purdy, Barbara A., and H. K. Brooks
1971 Thermal Alteration of Silica Minerals: An Archeological Approach. Science 173(3994):322-325.

Quinn, George D.
2006 Fractography of Ceramics and Glasses. Washington: United States Government Printing Office.

Rick, John W.
1978 Heat-Altered Cherts of the Lower Illinois Valley: An Experimental Study in Prehistoric Technology. Evanston: Northwestern University.

Rick, John W., and Sylvia Chappell
1983 Thermal Alteration of Silica Materials in Technological and Functional Perspective. Lithic Technology 12(3):69-80.

Rots, Veerle
2004 Prehensile Wear on Flint Tools. Lithic Technology 29(1).

Slesick, Leonard M
1978 A Lithic Tool Cache in the Texas Panhandle. Bulletin of the Texas Archaeological Society 49:319-330.

Smallwood, Ashley M.
2010 Clovis biface technology at the Topper site, South Carolina: evidence for variation and technological flexibility. Journal of Archaeological Science 37(10):2413-2425.

Speer, Charles A.
2010 Understanding the Effects of Heat Treatment of Edwards Plateau Chert. Ethnoarchaeology 2(2):153-172.

Stoner, Edward J.
2001 Quarriers, Arrow Makers, and Hunters of the Egan Range: A Case for Integrated Toolstone Procurement, Stone Tool Production, and Subsistence Masters, Anthropology Department, University of Nevada.

Tunnell, Curtis

1978 Versatility of a Late Prehistoric Flint Knapper: The Weaver-Ramage Chert Cache of the Texas Rolling Plains. *In* In the Light of Past Experience: Papers in Honor of Jack T. Hughes. B.C. Roper, ed. Pp. 367-397. Amarillo: Panhandle Archaeological Society.

Whittaker, John C.

1995 Flintknapping: Making and Understanding Stone Tools. Austin: University of Texas Press.

Wiseman, Regge N., Dorothy Griffiths, and James V. Sciscenti

1994 The Loco Hills Bifacial Core Cache from Southeastern New Mexico. Plains Anthropologist 39(147):63-72.

WCRM LITHICS LABORATORY MANUAL
NEWMONT LONG CANYON

February 8th, 2017
Revised June 1, 2017

PHASE V. PROJECTILE POINT ANALYSIS

The fifth phase of laboratory analysis is the formal, technological attribute analysis of projectile points from provenience categories across the site(s). Typically, on our excavations, tools and debitage are collected from both general surface collection as well as systematic excavation of 1 x 1 m units. WCRM generally excavates large 5 x 5 or 10 x 10-meter excavation grids as well as test units which can be located either within or outside of the excavation grids. Occasionally artifacts are collected from other proveniences such as auger probes and backhoe trenches. If you note any provenience information on a bag that is not being collected on the forms, check with a laboratory supervisor as to whether any modifications are needed. Below, the individual provenience and tool data to be recorded are described in detail in order to permit coding into the database.

Extreme care is necessary when analyzing, coding, and entering data. Each attribute of each artifact is potentially key to our ability to interpreting ancient behavior at these sites. This database is the baseline from which all interpretations and inferences are drawn. **Please be careful and accurate.**

If a field does not apply to a certain artifact, put a dash (-) in that space. For example, if an artifact was not point-provenienced, enter a dash (-) in the ProvN/ProvE and Elevation fields. However, if a field has a list of selections to choose from, you MUST choose one of the selections. If you feel that there is not an appropriate selection for a particular artifact, see the lab director about adding one.

CATALOG NUMBER: This is a number assigned to each artifact and its purpose is to make every data entry unique. Catalog numbers are tracked using the digital artifact inventory; please take care to avoid assigning duplicate catalog numbers.

SCAT NUMBER: This number indicates the catalog number of the bag of debitage where the sample came from. This is critical as it ties the sampled flake back to its original provenience

BOX NUMBER: Number of box where artifact is located. Always write the box number on the bag or envelope so that if the artifact is somehow separated from the collection it may be returned to its original box.

OUTBOX NUMBER: Number of outbox assigned to items sent for outside analysis. These boxes are temporary locations. When the item is returned it should be placed back in its original box.

SPECIMEN NUMBER: This number is assigned when an artifact is sent for outside analyses. If not applicable, enter "-".

ANALYST'S INITIALS (AnInit): Put your initials here.

ANALYSIS DATE (AnDate): The date the analysis was done.

PROVENIENCE DATA

DISCOVERY NUMBER: Enter the discovery number that was assigned to the site. If no discovery number was assigned, enter a dash "-".

AGENCY NUMBER: CrNV-XX-XXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

STATE NUMBER: 26EkXXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

LOCUS: Enter the locus designation, if applicable.

CONCENTRATION NUMBER (Conc): Enter the concentration number, if applicable.

SHOT NUMBER: Shot number is typically only assigned for artifacts collected using a total station.

BACKHOE TRENCH NUMBER (BHTrench): Enter the backhoe trench number, if applicable.

AUGER TEST: If item was recovered from an auger test, put the number of the auger test from which the item was collected.

SHOVEL TEST: Designation of the shovel test unit, if applicable.

EXCAVATION/TEST UNIT (Ex/Test Unit): Enter the Excavation or Test Unit number, if applicable.

GRID: If the material was recovered from a feature or unit in one of the collection grids, put the grid designation here.

GRID N: This refers to the northing, or the north coordinate, of the southwest corner of the 1 m x 1 m **excavation unit.** The excavation grid coordinates are always justified to the southwest corner which is directly related to the primary collection grid datum which has been given the arbitrary Cartesian coordinates of 100 m north/100 m east. In other words, a unit with a grid north designation of 105 north is five meters north of the primary collection grid datum. Enter only integer values (do not add "N").

GRID E: This refers to the easting, or the east coordinate of the southwest corner of the 1 m x 1 m **excavation unit**. This is encoded just like a north coordinate (e.g., a unit with a grid east designation of 105 east is five meters east of the primary collection grid datum). Use only the integer value.

PROVENIENCE NORTHING/PROVENIENCE EASTING (PROVN/PROVE): Horizontal provenience of a point-provenienced specimen, measured to the nearest centimeter. Provenience will be expressed as meters north and east, i.e. N100.25/E99.35, but only the number needs to be

recorded (do not add "N" or "E"). Items collected with GPS units will typically have UTMs associated with them and they should be added to this field as well.

PROVENIENCE ELEVATION (PROV ELEV): Absolute elevation of a point-provenienced specimen, measured to the nearest centimeter relative to the local excavation datum. This field should only be used when PROVN/PROVE are used.

UNIT LEVEL: For excavation units: this refers to the arbitrary 10 cm levels numbered sequentially from the surface. Surface artifacts from excavation units are coded as level "0". TElev and BElev are the top and bottom elevations of the level.

For surface collected artifacts in 1 x 1 m units within the grids: code as level "0" and put a dash in TElev and BElev. For artifacts collected from the surface throughout the site: code as level "0" and put a dash in TElev and BElev.

UNIT STRATUM: Enter the stratum designation, if applicable. Otherwise enter "-". If you notice that an artifact from a particular site does not have a stratum entry, but all the others do, then take the time to find the correct data in the appropriate records.

FIELD SPECIMEN NUMBER: Enter the field specimen number.

ANCILLARY FIELD SPECIMEN NUMBER: Enter the field specimen number.

TELEV: The top elevation of the level in which the artifact was located is recorded for excavated artifacts.

BELEV: The bottom elevation of the level in which the artifact was located is recorded for excavated artifacts.

FEATURE NUMBER: Feature number, if artifact is from a feature. Otherwise enter "-".

FEATURE PORTION: Horizontal provenience of the feature, e.g. N1/2 or NE1/4.

FEATURE LEVEL: this refers to the arbitrary 10 cm levels numbered sequentially from the origin (or truncated surface) of the feature.

FEATURE STRATUM: stratum designation assigned to feature deposits.

GENERAL DATA

MATTYPE: Material type of specimen.

- **Chert**
- **Fine-Grained Volcanic Rock (FGVR)**
- **Obsidian**
- **Quartzite**
- **Other (specify your thoughts on material type in comments)**
- **Indeterminate**

COLOR: Enter the color using the simple color selections (below). Pick the dominant color (**closest match**) or in the case of variegated material choose that option.

- **Black**
- **Gray**
- **Red/Pink**
- **Yellow**
- **Orange**
- **Green/Greenish Blue**
- **Blue/Purple**
- **Brown/Tan**
- **White**
- **Variegated**
- **Colorless/Translucent**

THERMALT: This category includes those **chert** materials which have been intentionally and successfully heat treated and those that have been burned (intentionally or not). If the material is not chert code as **Not Applicable**. Differential luster is the best evidence of heat treated items (usually a waxy luster fresh fracture surfaces with a matte luster on old scars). On occasion, color changes are evident (reddened exterior flaked surface with orange waxy interior flake scars). Crazing, spalling, the presence of pot lids, thermal fracturing, and/or a vitreous luster is present on burned items. There are examples of these features in the type collection. In the last 40 years numerous studies have investigated the changes that occur to stone during heat treatment (Bleed and Meier 1980; Buenger ; Patterson 1079; Purdy and Brooks 1971). Flintknappers have long recognized that heat treatment increases the "workability" of chert. Heat treatment tends to make the chert more brittle (Domanski and Webb 1992; Flenniken and Garrison 1975; Griffiths, et al. 1987; Rick 1978; Rick and Chappell 1983). The "level" of brittleness may be determined by certain temperature ranges obtained while heat treating (Speer 2010).

Thermally Altered/Burned. Includes those artifacts that exhibit crazing, spalling, pot lids, and/or vitreous luster. It is unlikely that these objects were deliberately heat treated.

Heat Treated. Includes those artifacts that exhibit differential luster. For example, this would include chert artifacts that exhibit waxy luster flake scars on matte surface. Examples are in the type collection. This category is defined to capture those artifacts that are deliberately heat treated.

None. Chert material with no indication of either thermal alteration or heat treatment.

Not Applicable. Includes all **non-chert materials**.

Fire Creek, Locus AC, burned flake with potlids and crazing (left). Fire Creek, Locus S, note intense crazing (middle). Hycroft biface (right) with heat treatment in the form of discoloration. Waxy orange flake scars intrude into and have removed the more matte reddened previous flake scars.

CONDITION: Condition of specimen in terms of completeness.

Complete. Tools should be considered complete if they do not appear to be missing significant portions. For example, if the tool is only missing a small piece and you *are fairly certain the measurements you are taking closely reflect the original length of the tool* then code as complete.
Refit Complete. The artifact is complete, but is in two or more pieces. Enter the catalog number(s) of the refitting piece(s) below if they were collected separately.
Refit Incomplete. The artifact is in two or more pieces that refit, but it is still incomplete. Enter the catalog number(s) of the refitting piece(s) below if they were collected separately.
Incomplete. Projectile points that are missing parts.
Indeterminate. Use sparingly.

INTEGRITY OF MEASURE: This field will let us know the integrity of the measurements.

Incomplete (length). Use this code if the maximum length of the tool is significantly jeopardized, but the width is still measureable.
Incomplete (width). Use this code of the maximum width of the tool is significantly jeopardized, but the length is still measureable.
Incomplete (length & width). Use this code if both the length and width are significantly jeopardized.
Indeterminate.

UV Long: How does the item fluoresce under longwave UV light?

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

UV Short: How does the item fluoresce under shortwave UV light?

Does Not Fluoresce.
Yellow-Orange.
Green.
Purple/Blue-Purple.

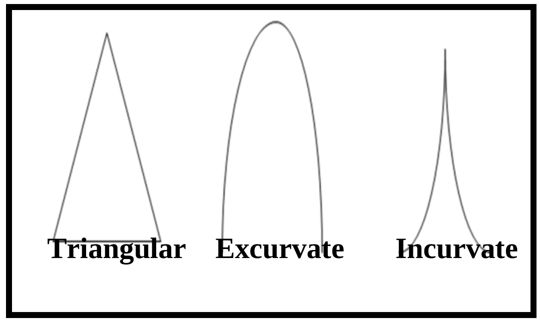
PROJECTILE POINT DATA

CORTEX: Amount of cortex remaining on specimen. If you are not sure if the surface is cortical see lab supervisor.

- **Absent**. Complete tool with no cortex.
- **1-25%.** Complete tool with 1-25% cortex.
- **26-50%.** Complete tool with 26-50% cortex.
- **51-75%.** Complete tool with 51-75% cortex.
- **76-100%.** Complete tool with 76-100% cortex.
- **Incomplete with Cortex.** Incomplete tool fragment that has any amount of cortex.
- **Incomplete without Cortex.** Incomplete tool fragment that has no cortex.
- **Indeterminate.** Use only if you are unsure if the tool has cortex or not.

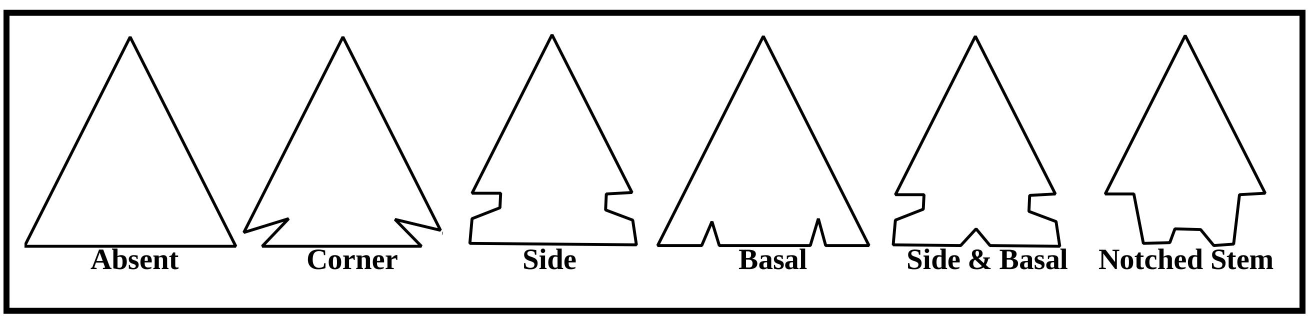
BLADE: Shape of projectile point blade.

- **Absent**.
- **Triangular.**
- **Excurvate.**
- **Incurvate.**
- **Indeterminate.**



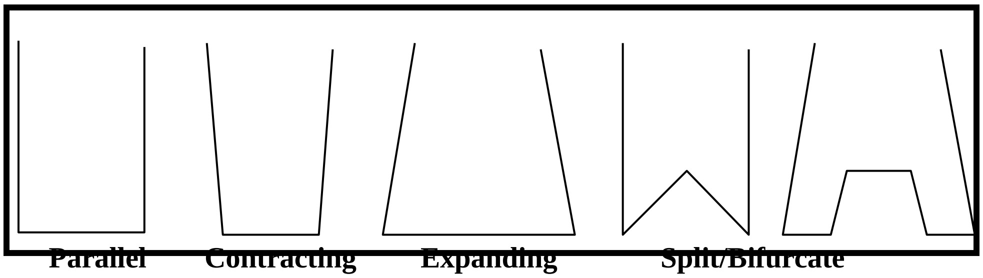
NOTCH: Type of notch.

- **Absent**.
- **Corner.**
- **Side.**
- **Basal.**
- **Side & Basal.**
- **Notched Stem.**
- **Indeterminate.**



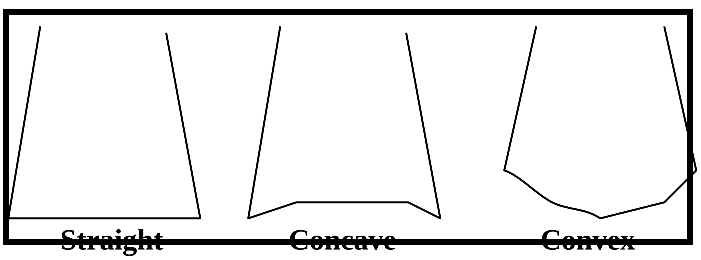
STEM: Type of stem morphology.

- **Absent**.
- **Parallel.**
- **Contracting.**
- **Expanding.**
- **Split/Bifurcate.**
- **Not Applicable (side-notched).**
- **Indeterminate.**



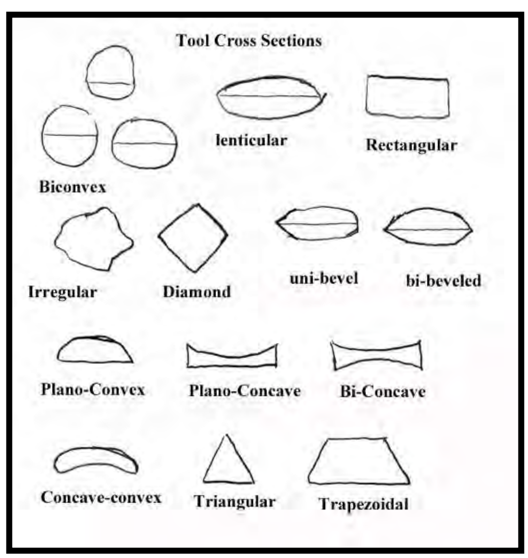
BASE: Type of base morphology.

- **Absent**.
- **Straight.**
- **Concave.**
- **Convex.**
- **Indeterminate.**



X-SEC: Cross section of specimen. Most projectile points and bifaces have lenticular cross sections.

- **Biconvex.**
- **Lenticular.**
- **Square or Rectangular.**
- **Irregular.**
- **Diamond.**
- **Beveled (one edge).**
- **Bi-beveled.**
- **Plano-convex.**
- **Plano-concave.**
- **Biconcave.**
- **Concave-convex.**
- **Triangular.**
- **Trapezoidal.**
- **Indeterminate.**

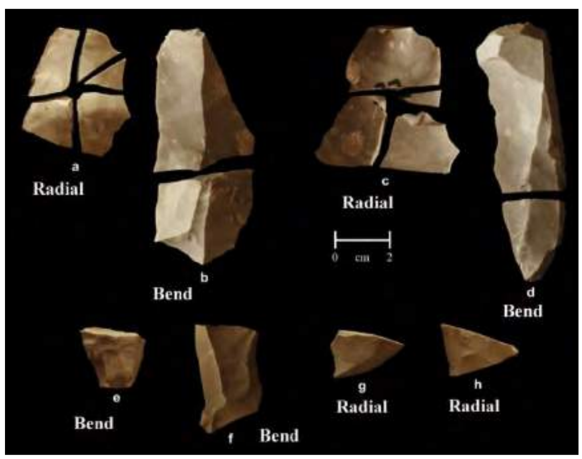


DO FLAKE SCARS CROSS THE MIDLINE OF THE PROJECTILE POINT? Do two or more reduction and/or thinning flakes cross the midline or not? This is important in terms of biface stage identification.

Yes.
No.
Indeterminate. This should mainly be used for small fragments.

DOES THE PROJECTILE POINT EXHIBIT EVIDENCE FOR A RADIAL BREAK? (**See below Figures):** Radial breaks are caused by downward force such as a deliberate hammerstone strike or sometimes trampling or even knapping errors. Hammerstone strikes can leave traces of deliberate breakage (see intentional breakage diagram below). Lips are more of a characteristic of bending breaks produced during biface manufacture than deliberate radial breakage. A typical radial break will have two or more laterals with approximate 90 degree breaks (see below illustration). Jennings (2011) study found radial breaks produced during biface production are significantly thicker than those produced during intentional radial breakage of flakes. There are examples of radial breakage in the type collection.

Yes.
No.
Indeterminate.



A and B are the result of deliberate breakage, C and D trampling and e-h were produced during biface manufacture (adopted from Jennings 2011:Figure 2).

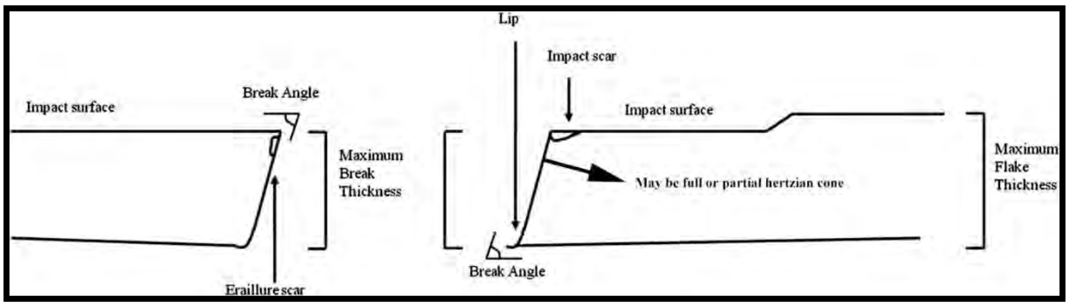
Left: An example of biface broken by bending and radial fracture (adopted from Miller 2006:Figure 5.22) caused by thinning with a antler billet with poor support of the tool. Right: This bending fracture resulted from cow trampling. The fracture is close to 90 degrees with a distinct compression lip.

DOES THE FLAKE EXHIBIT EVIDENCE FOR INTENTIONAL BREAKAGE? Intentionally striking a flake with a hammerstone or billet can leave distinctive evidence in the form of subtle impact scars above the break, errailure scars on the break, partial Hertzian cones (bulb) on the break. Do not attempt on tools smaller than approximately a quarter.

Yes. Our macroscopic observations (hand lens ok) should include trying to identify presence/absence of an impact scar on the tool surface **at break**, a partial hertzian cone on the break surface, and/or an errailure scar on the break surface.

No.

Indeterminate.



Some indications of direct flake breakage (from Jennings 2011:Figure 1).

DOES THE PROJECTILE POINT EXHIBIT EVIDENCE FOR AN UNINTENTIONAL PERVERSE/BENDING/SPIRAL/HERTZIAN (BOTH TRANSVERSE AND LONGITUDINAL) BREAK? Classify any flake siret breaks as "NO". Perverse Fracture – "A spiral-shaped fracture that is initiated at or near the edge of a biface. Improper platform alignment, preparation, and / or strike in relation to the biface plane causes bending in the mass of the object. Due to the angle of force, the fracture reorients itself perpendicular to the biface plane. An internal fracture within the biface or a crack that separates the biface into two sections may result" (Miller 2006:65).

Yes.

No.

Indeterminate.

An example of a biface broken by a bending fracture during late thinning. "The percussor was the small antler and the support method was on the leg. The fracture initiated above the biface plane and the resulting scar is bifurcated by the crack; the detached flake is also broken along this crack. The platform of the flake was truncated from the body of the flake on removal and was not recovered" (Miller 2006:38).

Note the compression curl on left piece. Miller describes the process that broke this tool, "…this biface was broken in two places due to bending fractures. Striking a thinning flake from the base, that did not release, caused the energy from the blow to snap the biface to the left of the strike and in the centre of the piece. It is likely that the centre broke due to it being thinner than the ends." (Miller 2006:43-44).

DOES THE PROJECTILE POINT APPEAR TO HAVE BEEN BROKEN AS A RESULT OF MATERIAL FLAW? There are several examples of this in the type collection. Evidence may be in the form of termination at a vesicle or inclusion or point of drastic change in material quality**.**

Yes.
No.
Indeterminate.

"Impurities" in this Tosawihi Chert caused the step fracture.

Is there vestige of ventral surface? If the point is incomplete, this is made on the incomplete piece (as well as complete). There should be no indeterminates.

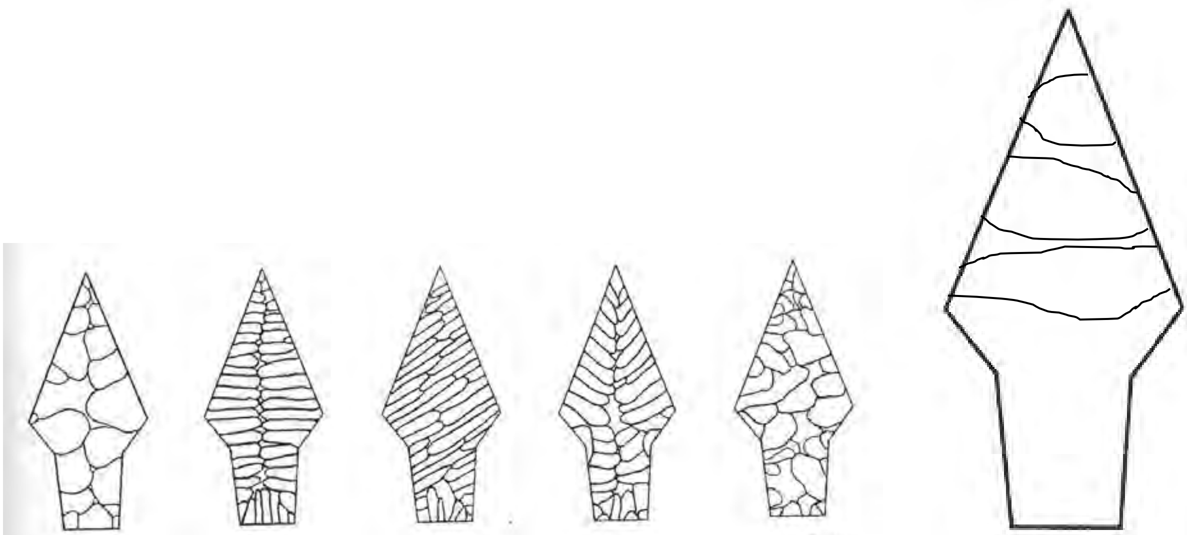
Yes
No

Is there marked curvature? If the point is incomplete, this is made on the incomplete piece (as well as complete). There should be no indeterminates.

Yes
No

FLAKING PATTERN: The dominant flaking pattern on the specimen.

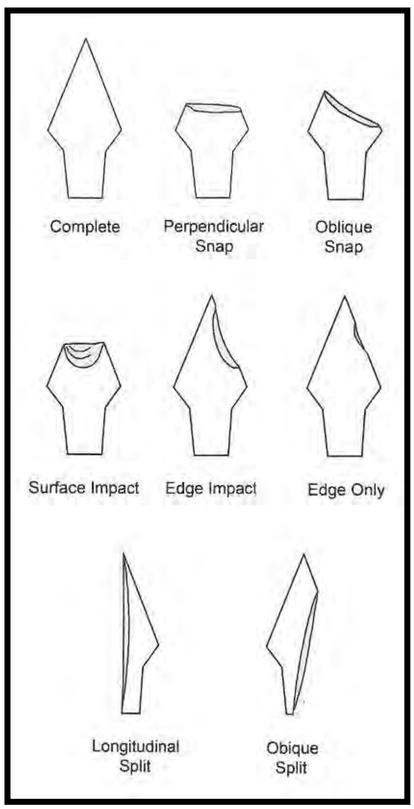
- **Collateral.**
- **Parallel.**
- **Parallel Oblique.**
- **Chevron.**
- **Irregular.**
- **Outrepassé.**
- **Indeterminate.**



Flaking Pattern. Image modified from Beck and Jones (2009:Fig. 6.5).

FRAGMENT: The remaining portion of the specimen being analyzed.

- **Complete.**
- **Tip/Blade.**
- **Midsection.**
- **Stem/Base.**
- **Tip/Blade and Midsection.**
- **Midsection and Stem/Base.**
- **Stem/Base and Tang(s).**
- **Tang/Edge.**
- **Missing Tang(s).**
- **Indeterminate.**



NUMBER OF BREAKS: Enter the number of breaks.

BREAKAGE TYPE 1: The type of break present on the specimen.

- **Complete.**
- **Perpendicular Snap.**
- **Oblique Snap.**
- **Surface Impact.**
- **Edge Impact.**
- **Edge Only.**

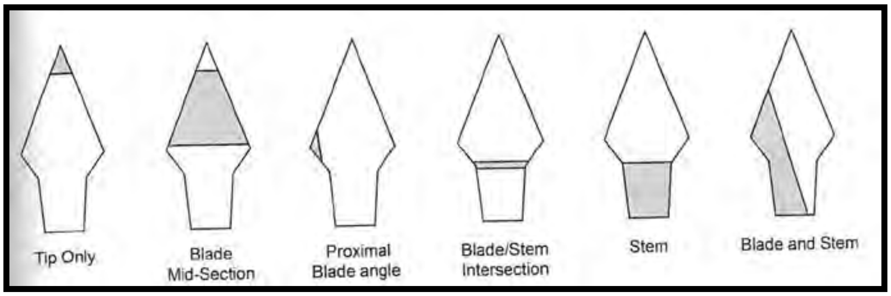
Longitudinal Split.
Oblique Split.
Indeterminate.

BREAKAGE TYPE 2: Code the second break type, if present, using the same categories as above.

Breakage Type. Image from Beck and Jones (2009:Fig. 6.3).

BREAK LOCATION 1: The location of the break noted above.

Absent.
Tip Only.
Blade Midsection.
Proximal Blade Angle.
Blade/Stem Intersection.
Stem.
Blade and Stem.
Tip and Tang(s).
Just Tang(s).
Indeterminate.



Break Location. Image from Beck and Jones (2009:Fig. 6.4).

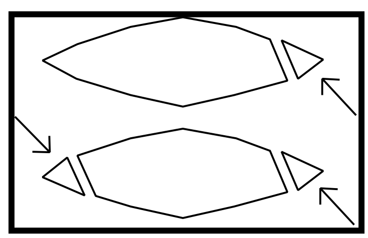
BREAK LOCATION 2: The location of the second break, if present, using the same codes as above.

RESHARPENING LOCATION: The location of any resharpening, using the same location designations as with breaks noted above, unless it has been resharpened into another tool.

Absent.
Tip Only.
Blade Midsection.
Proximal Blade Angle.
Blade/Stem Intersection.
Stem.
Blade and Stem.
Into Another Tool.
Tip and Tangs.
Indeterminate.

BEVELING: The location of beveling on the specimen. Beveling is thought to be the result of resharpening a specimen while still in the haft, and therefore only one edge, or occasionally beveling alternate margins of opposing edges.

Absent.
Blade.
Stem.
Blade and Stem.
Indeterminate.



Note the roughly centered biface edge on the left side of the specimen, and the heavy beveling on the right side (left image). Right image shows a single beveled edge (top) and beveling of alternate margins on opposing edges.

STEM GRINDING: The degree to which the **<u>lateral margins</u>** of the stem has been dulled by grinding against an abrasive surface. See images of Fire Creek specimens below.

Absent.
Light.
Moderate.
Heavy.
Indeterminate.

Light **Moderate** **Heavy**

BASAL GRINDING: The degree to which the **<u>basal margin</u>** of the stem has been dulled by grinding against an abrasive surface. See images above.

- **Absent.**
- **Light.**
- **Moderate.**
- **Heavy.**
- **Indeterminate.**

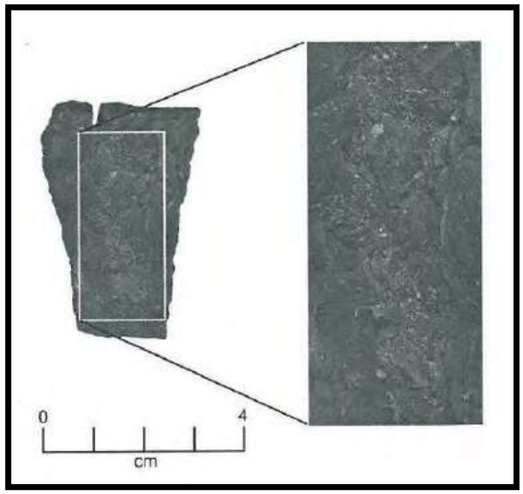
FACET: Is there a remnant flat facet remaining on the specimen (usually near the tip or the base)? Often these facets are cortical. These facets may have been remnant platforms from the original flake removal, or they may just be a left-over facet that was not necessary to remove in order to shape and finish the projectile point.

Absent.
Present.
Indeterminate.

\

HAFT WEAR: Is there evidence of obvious haft wear on the hafted portion of the specimen (base/stem)? Haft wear evidence is identified by worn or rounded arrises that are limited to the hafting region of the point.

- **Absent**
- **Present**
- **Hafted element not present**
- **Indeterminate**



Heavy haft polish on Cougar Mountain point (from Beck and Jones 2009: Fig 6.3).

BLADE WEAR: Is there evidence of use-wear on the blade portion of the specimen? Blade wear evidence is identified by worn or rounded edges. If the entire margins exhibit wear then there is a good chance it is from natural processes and not use-related.

- **Absent**
- **Minimal**
- **Moderate**
- **Heavy**
- **Blade not present**
- **Wear present but probably natural**
- **Indeterminate**

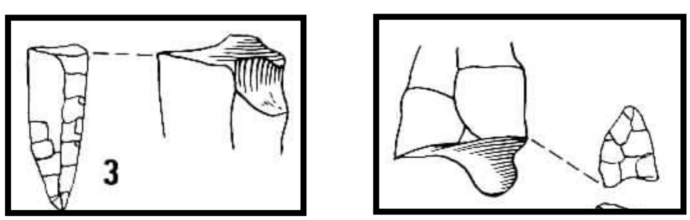
SERRATION: Is the blade of the specimen serrated? If blade is not present, use Indeterminate.

- **Absent**
- **Present**
- **Indeterminate**

Note the serrated blade on this Pinto Point.

HINGED BREAK: If the specimen is broken via perpendicular or oblique snap, is a hinge present? Geneste and Plisson (1993) note that hinge fractures in excess of 2 mm rarely occur on tools broken by means other than use as a projectile.

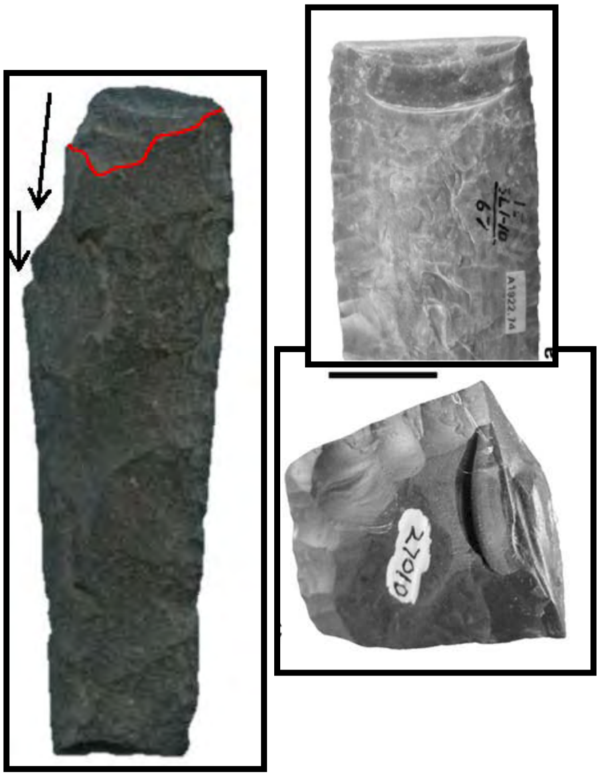
- **Absent**
- **Present**
- **Indeterminate**



Hinged breaks on point fragments (image modified from Geneste and Plisson 1993:Fig.2).

STEP-TERMINATING BENDING FRACTURE: If the specimen is broken via a bending fracture, does the negative hinge scar end in a step termination? Fischer et al. (1984) identify this break type as diagnostic of projectile use/breakage. Step-terminating bending fractures result from pressure parallel to the ends of the specimen, as opposed to perpendicular pressure. If you are unsure if a specimen is broken via snap or cone, ask a lab manager. If point is complete, use Absent.

Absent
Present
Indeterminate



Stemmed point from Fire Creek with step-terminating bending fracture outlined in red (left), and Hell Gap points from Frazier site (top right) and Casper site (bottom right) (from Villa et al. 2009:Fig 12).

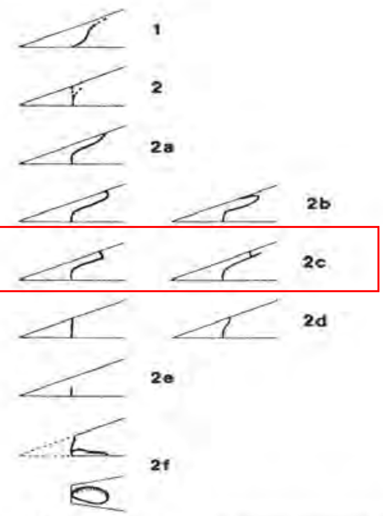


Fig. 5. Definition of macroscopic fractures on projectile points of lithic materials.
1: *Cone fracture (cone initiating fracture).* The fracture initiates from a point or a small, well-defined area, having a concave profile in the area of initiation (shown in longitudinal section).
2: *Bending fracture (bending initiating fracture).* The fracture initiates from a large area and has a straight or convex profile along its whole area of initiation.
2a: *Feather terminating bending fracture.* A bending initiating fracture which before meeting the opposite surface of the specimen runs parallel to this, and which meets the surface in an acute angle or in a curve less than or equal to 90°.
2b: *Hinge terminating bending fracture.* A bending initiating fracture which before meeting the opposite surface of the specimen runs parallel to this, and which meets the surface in a curve larger than 90°.
2c: *Step terminating bending fracture.* A bending initiating fracture which before meeting the opposite surface of the specimen runs parallel to this, and which thereafter makes an abrupt change of direction to meet the surface in a right angle.
2d: *Snap fracture (snap terminating bending fracture).* A bending initiating fracture which meets the opposite surface of the specimen without having at any point run parallel to this.
2e: *Embryonic bending fracture (unfinished bending initiating fracture).* A bending fracture where part of the fracture path ends before having reached the surface of the specimen. Thus, the fracture has not divided the specimen.
2f: *"Spin-off" fracture.* Cone fracture which initiates from a bending fracture and which removes parts of the original surface of the specimen (shown in longitudinal section and from the side).

Definitions and examples of cone and bending fractures, from Fischer et al. (1984:Fig. 5).

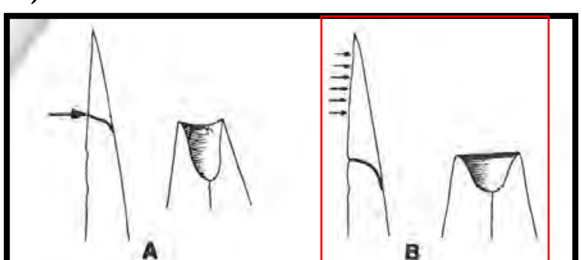


Fig. 4.
A. Example of cone fracture (seen in longitudinal section and in dorsal view). The force is applied over a relatively limited area and the fracture initiates in the immediate vicinity of the contact area.
B. Example of bending fracture (seen in longitudinal section and in dorsal view). The force is applied over a relatively large area and the fracture does not necessarily initiate in the immediate vicinity of the contact area.

Examples of cone and bending fractures, from Fischer et al. (1984:Fig. 4).

IMPACT FLUTE SCAR: Does the specimen exhibit a flake scar on either face that originates near the tip and travels toward the proximal end? Impact flute scars initiate as cone fractures and travel down the face. Impact flute scars are diagnostic of projectile damage in experimental studies (Barton and Bergman 1982; Bergman and Newcomer 1983; Odell and Cowan 1986) and archaeological examples (Barton and Bergman 1982; Bergman and Newcomer 1983; Bradley 1982; Dockall 1997; Frison 1978; Frison and Bradley 1980). They can exhibit feather, step, or hinge terminations. If you are unsure if a specimen is broken via snap or cone, ask a lab manager. If point is complete, use Absent.

- **Absent**
- **Present (Feather)**
- **Present (Step)**
- **Present (Hinge)**
- **Indeterminate**

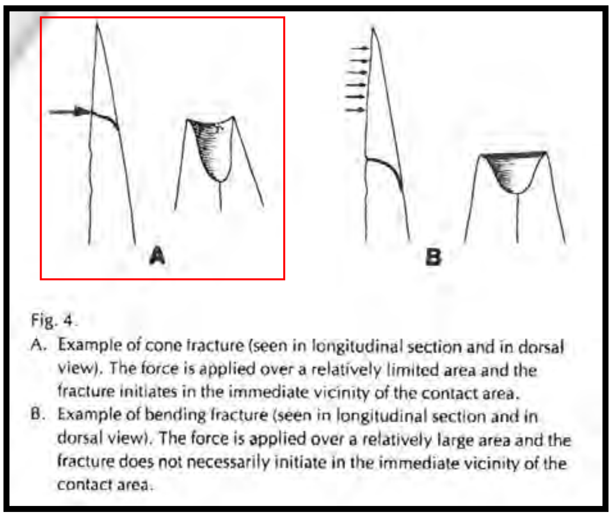


Figure shows a cone-initiated flute fracture (Image from Fischer et al. [1994:Fig. 4).

An experimental cone-initiated flute fracture produced from thrusting hafted point into animal and contacting bone.

UNIFACIAL SPIN-OFF: If the specimen is broken via perpendicular or oblique snap, is there a unifacial spin-off present? Fischer et al. (1984) describe spin-off fractures as small cone-fracture spalls that initiate at the location of the bending fracture and travel down the tool face; they occur when the tool snaps but retains a high amount of kinetic energy in the shaft that forces the two fragments to contact, resulting in spin-offs. Unifacial spin-offs can be diagnostic of use/breakage during use as a projectile. The size of the spin-off created during impact varies depending on the size of the projectile point. Small points (dart- and arrow-sized) with unifacial spin-offs that measure 1 mm or greater are diagnostic of use/breakage during use as a projectile. Larger points (spear-sized?) with unifacial spin-offs that measure 6 mm or greater are diagnostic of use/breakage during use as a projectile. Smaller spin-offs can occur during manufacture errors, tramping damage, etc. If point is complete, use Absent.

Absent
Present
Indeterminate

Experimental point broken during impact. Arrows point to unifacial spin-offs.

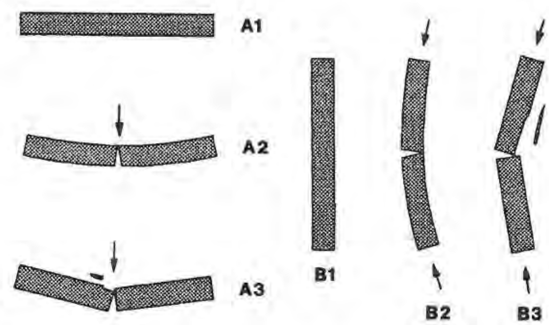
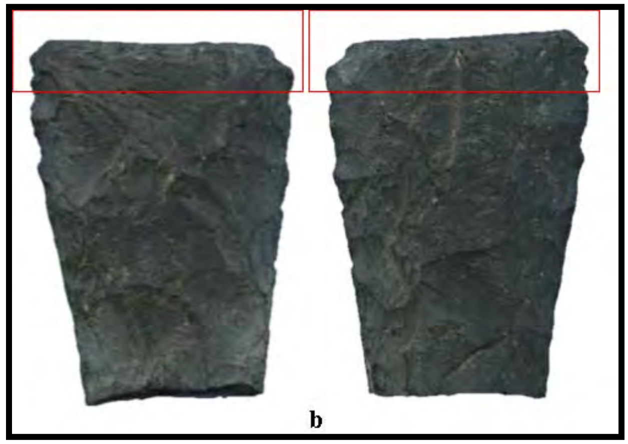


Fig. 6. Theoretical examples of the occurrence of bending fractures as a result of pressure from the broad sides and ends respectively.
A1: Flint specimen prior to pressure.
A2: Flint specimen exposed to pressure from one broad side making the specimen bend and finally break.
A3: Continued pressure from the broad side makes the surfaces of the fracture touch each other producing a small spin-off fracture.
B1: Flint specimen prior to pressure.
B2: Flint specimen exposed to pressure from the ends making the specimen bend and finally break.
B3: Continued force from the ends presses the surfaces of the fracture against each other producing a large spin-off fracture.

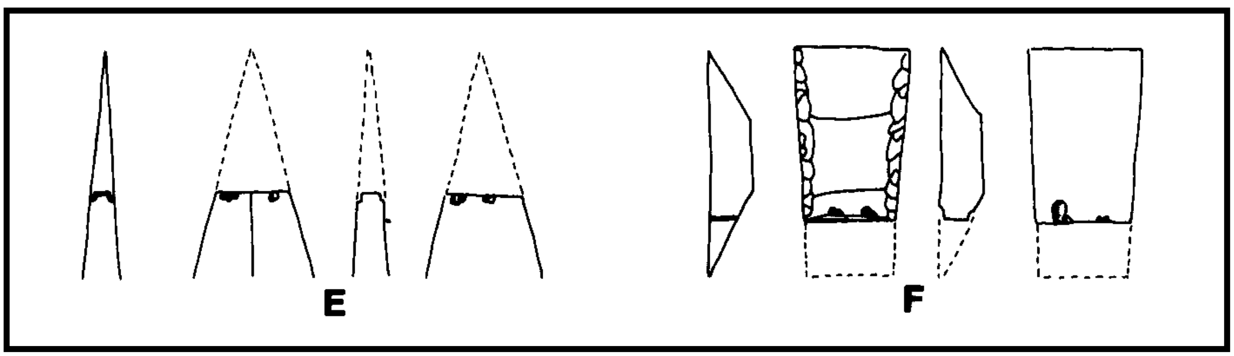
Model of how spin-offs are created, from Fischer et al. (1984:Fig. 6).

BIFACIAL SPIN-OFF: If the specimen is broken via perpendicular or oblique snap, are there spin-offs on both faces of the same break? Bifacial spin-offs on the same break are diagnostic of use/breakage during use as a projectile and are not created during manufacture errors, tramping, etc. (Fischer et al. 1984). Size does not matter with bifacial spin-offs, just their presence/absence. If point is complete, use Absent.

Absent
Present
Indeterminate



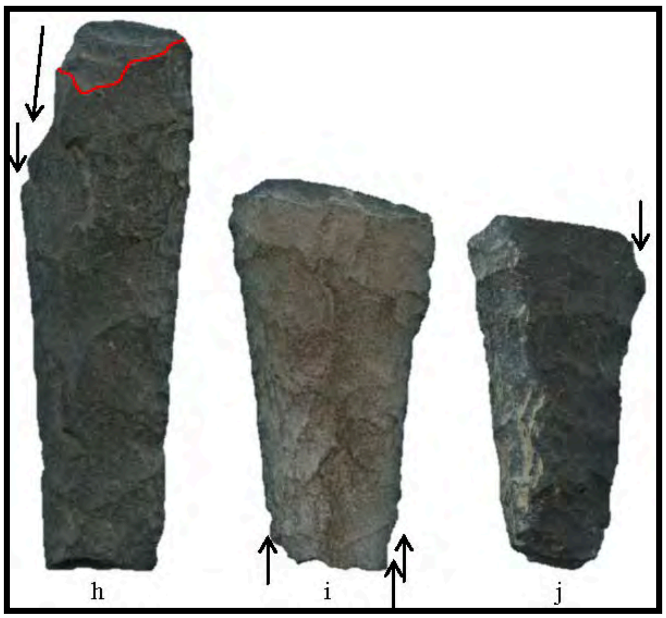
Bifacial spin-offs on archaeological specimens from Fire Creek, Locus A/R.



Idealized examples of bifacial spin-offs, from Fischer et al. (1984:Fig. 7).

IMPACT BURINATION: Does the specimen exhibit a break that travels down the lateral edge? These burin-like fractures (also called lateral macrofractures) can originate from the tip of a point or at the location of a perpendicular or oblique snap. Burination of this sort can occur upon impact with a hard object during use as a projectile and are not necessarily intentionally created (Barton and Bergman 1982; Bergman and Newcomer 1983; Dockall 1997; Lafayette 2006; Odell 1981; Odell and Cowan 1986; Shea 1988). All burins should be examined for use-wear. If point is complete, use Absent.

Absent
Present
Indeterminate

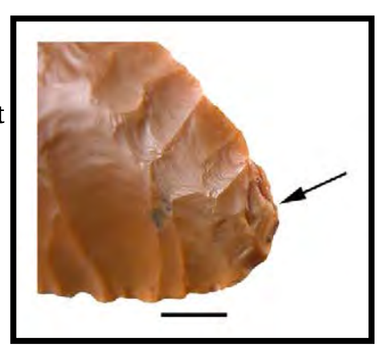


Impact burination (lateral macrofracture) on archaeological specimens from Fire Creek (left) and experimental projectile point (right). Arrows point to direction of burin spall removal.

CRUSHING: Is the distal end crushed? This structural collapse can occur upon impact with rigid materials (bone, large boulders, wood) and should appear as multiple overlapping small step fractures that travel proximally from the distal end (Lieberman and Shea 1994; Titmus and Woods 1986).

Absent
Present
Indeterminate

Arrows point to crushing present on tip of projectile points. Left image, crushing on Hell Gap point from Frazier site from Villa et al. (2009:Fig 15). Right image, crushing on Silver Lake point from Fire Creek.



USE-WEAR AS OTHER TOOL?: Is there wear or other damage on the specimen that may indicate it was used as something other than a projectile point and may include drilling, twisting, graving, scraping, chopping, sawing, etc? If Present, put the potential use-wear type you think it has in the Comments section.

Absent
Present
Indeterminate

PROJECTILE POINT TYPE: Code the appropriate projectile point type (see attached sheets for examples of each projectile point type and flow charts for identifying types and fragments).

Desert Side-notched
Cottonwood Triangular
Cottonwood Leaf-shaped
Rosegate
Elko Eared
Elko Corner-notched
Gatecliff Split Stem
Gatecliff Contracting Stem
Humboldt
Pequop (To identify those points at Long Canyon that may be transitional between Large side notched and Elko series).
Large Side-notched
Pinto
Windust
Parman
Cougar Mountain
Haskett
Silver Lake
Lake Mohave
Western Fluted
Indeterminate Corner-notched
Indeterminate Side-notched
Indeterminate Short Stemmed
Indeterminate Long Stemmed
Indeterminate Arrow-sized
Indeterminate Dart-sized
Indeterminate Elko Series
99 **Indeterminate**

DOES THE PROJECTILE POINT FIT A KEY? Please check this box if the projectile point fits a particular key (e.g. Thomas 1981). The key features of the Thomas key are described below.

Yes
No
Indeterminate

Table summarizing Thomas (1981) point type criteria (from Hoskins 2016:Table 2.8).

Large Side-notched	PSA's >130 degrees and weight ≥1.5 g
Elko Corner-notched	PSA's between 100 and 150 degrees, basal width >10 mm, and BIR's >.93
Elko Eared	PSA's between 110 and 150 degrees, basal width >10 mm, and BIR's ≤0.93
Gatecliff Contracting Stem	PSA's ≤100 degrees or NO ≥60 degrees, BIR's >.97, and weight >1 g
Gatecliff Split Stem	PSA's ≤100 degrees or NO ≥60 degrees, BIR's ≤.97, and weight >1 g
Desert Side-notched	PSA's >130 degrees, weight <1.5 g, and Bw/Mw >.90
Rosegate Corner-notched	PSA's between 90 and 130 degrees, basal width ≤10 mm, and neck width ≤ [basal width + .5 mm]

<u>**METRIC ATTRIBUTES**</u>

Using digital calipers please record the dimensions to the nearest 0.1 mm.

MAX LENGTH: The maximum dimension from proximal to distal. Always take this measurement, regardless of the point's completeness.

AXIAL LENGTH: The length along the longitudinal axis (in some cases will be equal to the max length, but will be different on split/bifurcate-stem and concave base projectiles). Only take this measurement if the point is complete or very nearly complete. Otherwise code as "-".

EXTRAPOLATED LENGTH: In cases where the broken point dimensions can be reasonably extrapolated from a piece broken and not reworked, please estimate the maximum length before the specimen was broken (see below illustration).

BLADE LENGTH: The length of the blade, measured from the shoulder to the tip along the longitudinal axis. If the two blade edges are different, use the longest edge. Only take this measurement if the blade is complete. Otherwise code as "-".

SHOULDER LENGTH: The length of the shoulder on the tool. Shoulder is defined as a separation between the blade and stem that forms an oblique angle from the proximal portion of the blade and distal portion of the stem. This is only appropriate on <u>stemmed points</u> with DSA's greater than 180 degrees. The shoulder length value is determined by subtracting the blade length and stem length from the max length. Only take this measurement if shoulder is complete. Otherwise code as "-".

STEM LENGTH: The length of the stem measured from the neck to the base. If the two stem edges are different, use the longest edge. Only take this measurement if stem is complete. Otherwise code as "-".

MAX WIDTH: The maximum distance from edge to edge perpendicular to, and in the same plane as length. Always take this measurement, regardless of the point's completeness.

BLADE WIDTH: The maximum width of the blade portion of the specimen. This will often be the same as max width. If the portion of the blade where the blade width would be greatest is missing, then code as "-".

EXTRAPOLATED WIDTH: In cases where the broken specimen dimensions can be reasonably extrapolated from a piece broken and not reworked, please estimate the maximum width before the tool was broken (see below illustration).

NECK WIDTH: The maximum width of the neck of the specimen, just before it curves back out towards the shoulders or tangs. Only take this measurement if neck width is complete. Otherwise, code as "-".

BASE WIDTH: The width of the base of the specimen. Only take this measurement if base width is complete. Otherwise, code as "-".

THICKNESS: The maximum dimension at right angles to the plane in which length and width were measured.

WEIGHT: Weight of the specimen to the nearest 0.1 of a gram.

Extrapolation of other measurements in comments: If you think you can reasonably extrapolate measurements for incomplete attributes that do not have extrapolated measurement fields already (e.g. Blade Length, Shoulder Length, Neck Width, etc.), then please put measurements in the comments field in the following manner:

Comments
Blade Length: measures 34 mm as is, but would roughly measure 35 mm if it were intact.

For extrapolated measurements, other than max length and max width, only extrapolate when the attribute is nearly complete already and you are fairly certain of its extrapolated measurement.

EDGE ANGLE 1: Record the angle at which the two faces of a biface intersect as per Callahan (2010). Angles are recorded to the nearest 1 degree using a goniometer. Rather than take multiple measurements and average them, the analyst should hold the biface up and examine the cross section with the aid of the goniometer to determine the best estimated angle for one edge. This can also be done in concert with Callahan's angle chart.

EDGE ANGLE 2: The edge angle of the other side, determined as described above.

DISTAL SHOULDER ANGLE (DSA): Distal Shoulder Angle is the angle formed between a line drawn along the shoulder where it intersects with a line perpendicular to the longitudinal axis of the specimen. If both left and right angles can be measured, use the average of the two measurements. If only one angle can be measured, it should be considered representative of the specimen. DSA ranges between 90 and 270 degrees. Measured to nearest 1 degree on polar coordinate paper or with ImageJ software.

PROXIMAL SHOULDER ANGLE (PSA): Proximal Shoulder Angle is the angle formed between a line drawn along the edge formed by the proximal edge of the base/stem to the neck and where it intersects with a line perpendicular to the longitudinal axis of the specimen. If both left and right angles can be measured, use the average of the two measurements. If only one angle can be measured, it should be considered representative of the specimen. PSA ranges between 0 and 270 degrees. Measured to nearest 1 degree on polar coordinate paper or with ImageJ software.

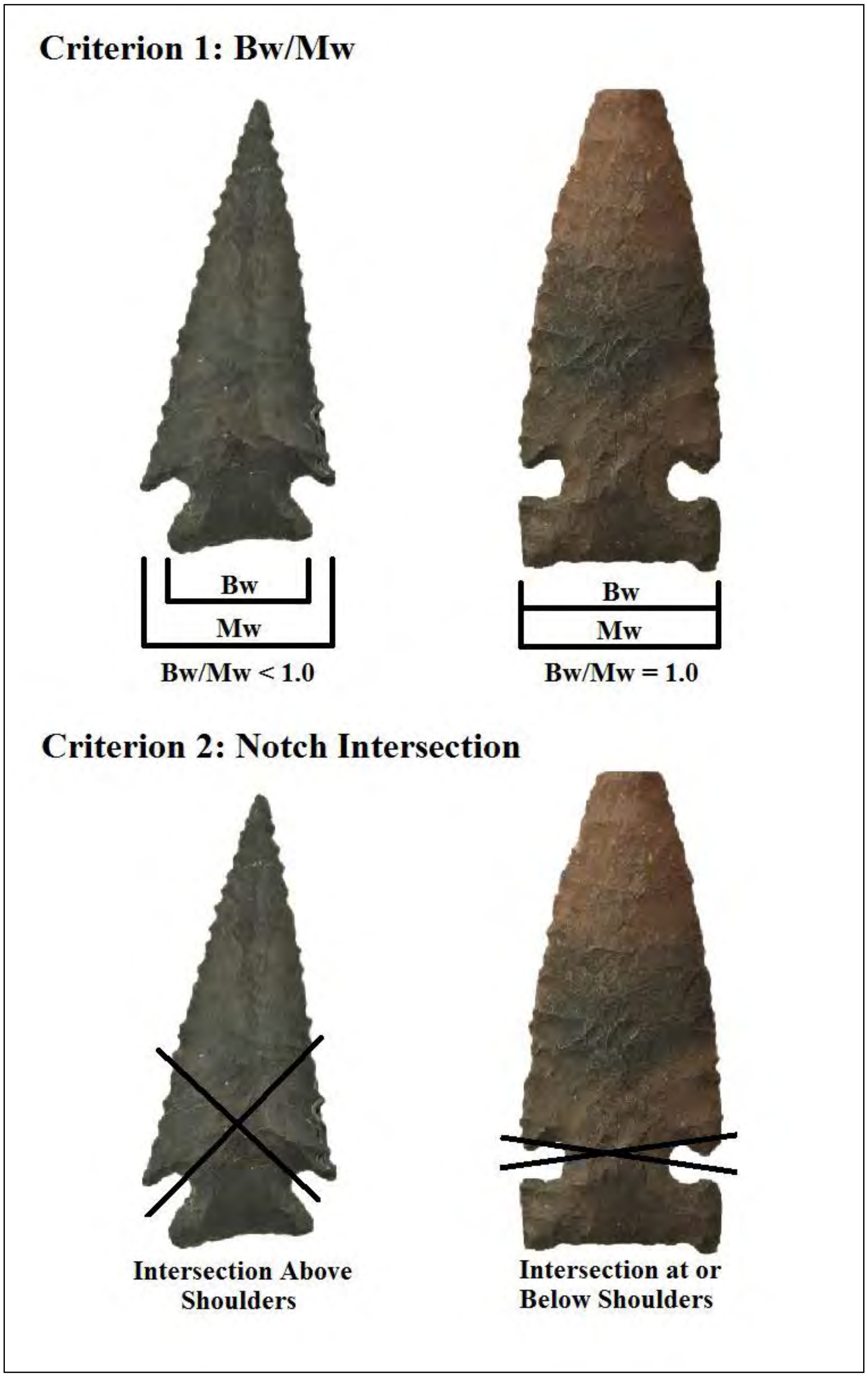
NOTCH OPENING ANGLE (NOA): Notch Opening Angle measures the angle formed by the intersection of a line drawn along the shoulder/tang and a line drawn along the lateral edge of the base/stem. It can easily be calculated by subtracting the PSA from the DSA. Measured to nearest 1 degree on polar coordinate paper or with ImageJ software.

LARGE SIDE AND CORNER NOTCHED DART POINTS BASE TO UPPER NOTCH MEASUREMENT (see below Figure): Hoskin's (2016) research has indicated that one potentially important variable to understanding changes in "Elko" type points through time is the location of the height of the notch relative to the base. Hoskin (2016:114) observed that the notch placement appears to be higher on corner notched points from the Middle Holocene than those in the Late Holocene. This measurement is only taken on side notched points and corner notched dart points. The goal of the measurement is to ascertain the distance from the base of the projectile point to the uppermost area of the notch. The projectile notches, barbs and base must be intact enough for the measurement to be meaningful. Align the projectile point so that the tip faces up and the point is as square as possible. Draw a straight line that contacts the lowest point of the base. This line is meant to be indicative of where the squared off base of the preform would have been. From that line measure the distance to the uppermost point of the notch which will most likely be the tip of the barb on corner-notched points. If possible, take the measurement on both sides of the point and average.

HOCKETT CRITERION 1 (see below Figure). This measurement is taken to help ascertain if a projectile point is side notched or corner notched (i.e. to help distinguish Elko, LSN and perhaps Pequop points). Corner notching is expected to remove a portion of base and therefore can be quantifiable by taking two measurements. The basal width and the maximum width and then dividing the basal width by the maximum width. When BW/MW is less than 1.0, the base is not the widest part of the point which suggests it is a corner notched point. Conversely when the maximum width and basal width are equal or nearly so, it is a side-notched point. The field is auto calculated in the database.

HOCKETT CRITERION 2 (see below Figure). This test is conducted by sketching the Elko or Large side-notched point and drawing a line through both notches. Do not attempt the test if the point is missing ears or tangs. The line corresponds to the approximate angle of notching. If the two lines intersect above the shoulders, a corner notched point is suggested. When the two lines intersect below the shoulder, a side notch point is suggested.

Lines intersect above the shoulders
Lines intersect below the shoulders
Indeterminate/Not Applicable



Hockett's Criterion 1 and 2 (from Hoskins 2016:Figure 2.3).

BASAL INDENTATION RATIO (BIR): Calculated by dividing the Axial Length by the Max Length and will range between 0 and 1. Calculate to two (2) decimal places (0.01). This field is auto calculated in the database.

MAX LENGTH/MAX WIDTH RATIO (ML/MW): Calculated by dividing the Max Length by the Max Width. Calculate to two (2) decimal places (0.01). This field is auto calculated in the database.

BASAL WIDTH/MAX WIDTH RATIO (BW/MW): Calculated by dividing the Basal Width by the Max Width. Calculate to two (2) decimal places (0.01). This field is auto calculated in the database.

NECK WIDTH/MAX WIDTH RATIO (NW/MW): Calculated by dividing the Neck Width by the Max Width. Calculate to two (2) decimal places (0.01). This field is auto calculated in the database.

STEM LENGTH/MAX LENGTH RATIO (SL/ML): Calculated by dividing the Stem Length by the Max Length. Calculate to two (2) decimal places (0.01). This field is auto calculated in the database.

HINGE LENGTH: Measure the length of the hinge on hinge-fractured breaks, if present. Enter a "-" if not applicable.

IMPACT FLUTE LENGTH: Measure the length of the impact flute fracture, if present. Enter a "-" if not applicable. Impact flute lengths greater than 3 mm are diagnostic of breakage during use as a projectile (Lieberman and Shea 1994; Shea 1988, 1991).

UNIFACIAL SPIN-OFF LENGTH: Measure the length of the longest unifacial spin-off, if present. Enter a "-" if not applicable.

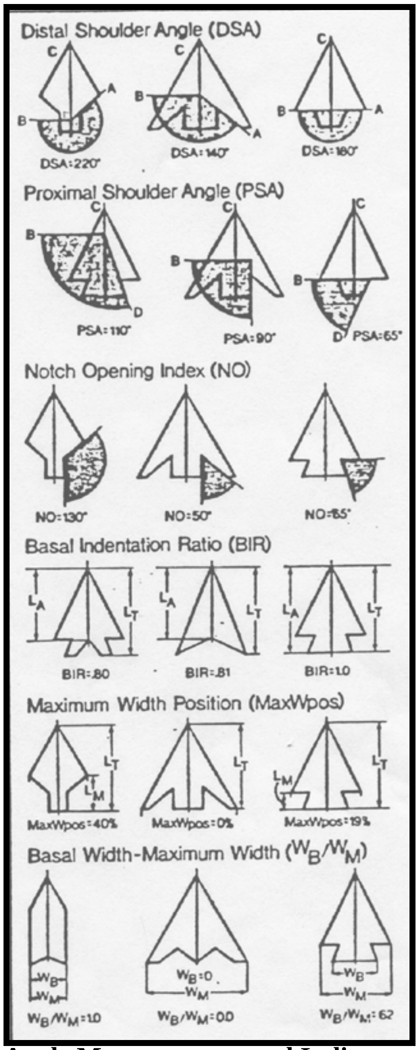
AREA OF THE BIFACE AS DETERMINED BY IMAGE J SOFTWARE: Enter area in square cm or enter a dash "-" if this measurement was not taken at this time.

JOHNSON THINNING INDEX: This is an alternative to biface stage classification developed by Johnson (Bement 1991) and recently applied by Beck and Jones to Paleoarchaic biface analysis (Beck, et al. 2002). The index has two major advantages in that it helps remove subjectivity from an assessment of biface stage analysis and it can be calculated on fragmentary bifaces. The index is a ratio of weight to plan view area (WEIGHT/AREA). The plan view area can be calculated manually or by the aid of computer morphometric analysis. We have not yet determined how our sample will be calculated.

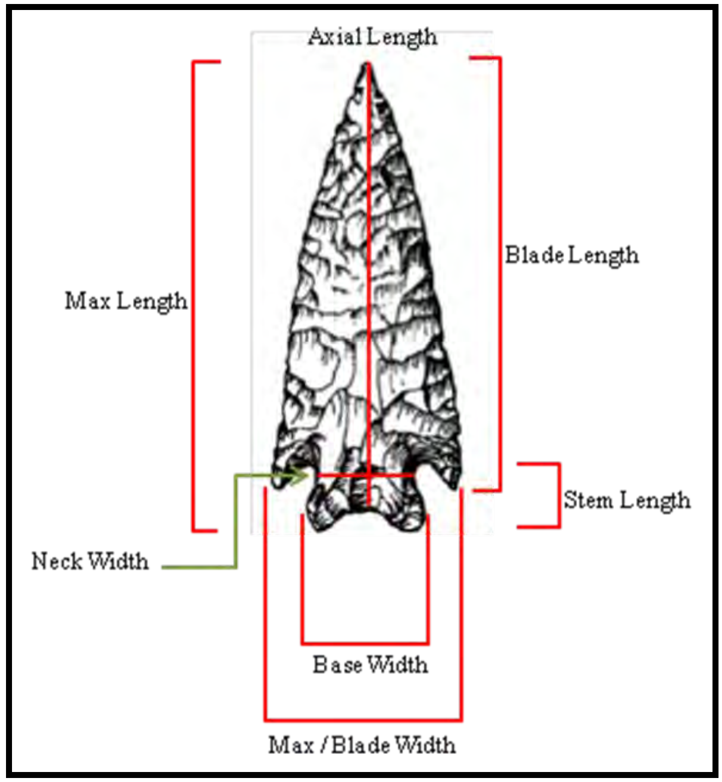
Enter ratio or enter a dash "-" if this measurement was not taken at this time.

COMMENTS: All important characteristics that are not specifically coded should be described here along with any observations you feel are important. Include Rosegate variant (ie, Rose Spring or Eastgate), if applicable.

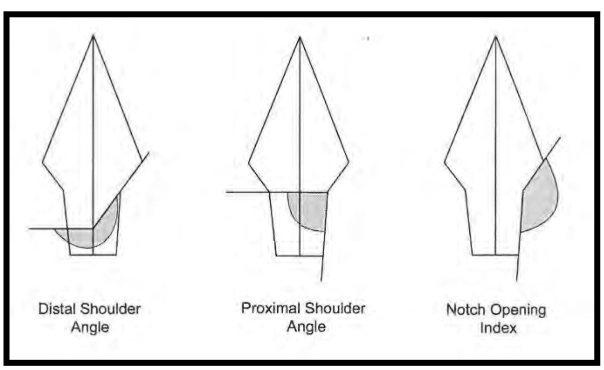
MEASUREMENT & ANGLE CHEAT SHEET



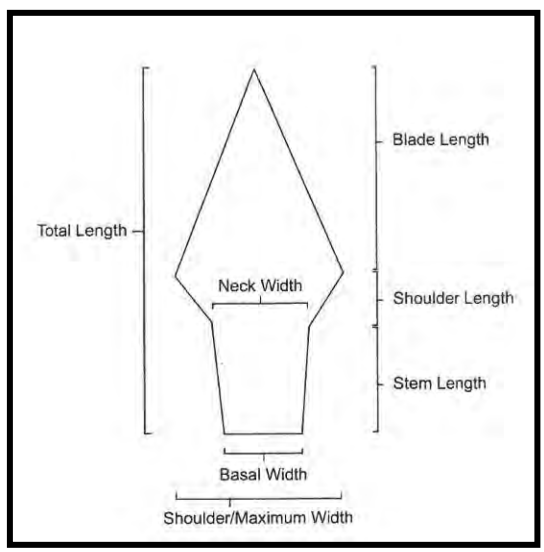
Angle Measurements and Indices on notched points. Image from Thomas (1981:Fig. 3).



General Measurements on notched points. Image modified from Heizer and Hester (1978:Fig. 3).

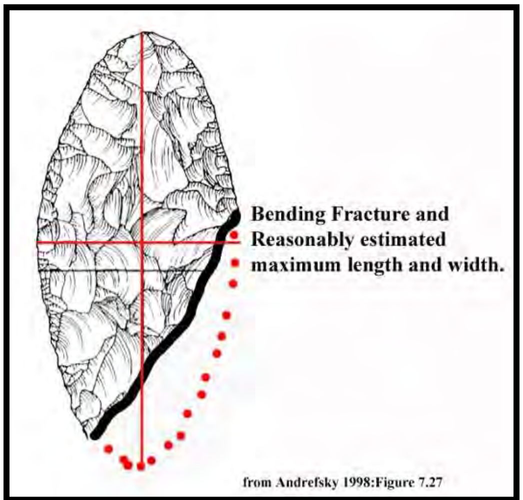


Angle Measurements on stemmed points. Image from Beck and Jones (2009:Fig. 6.2).

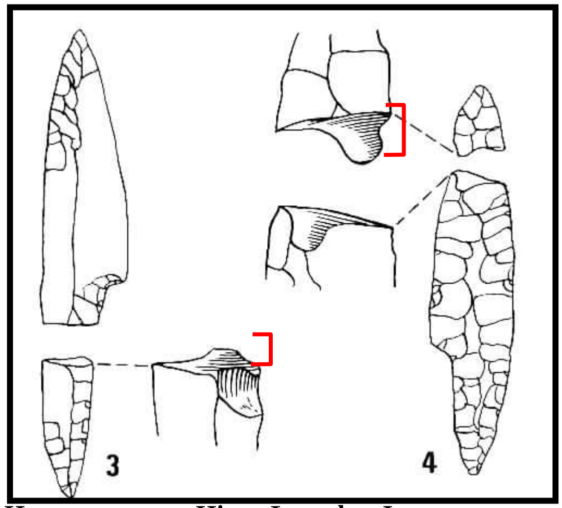


General Measurements on stemmed points. Image from Beck and Jones (2009:Fig. 6.1).

MEASUREMENT & ANGLE CHEAT SHEET



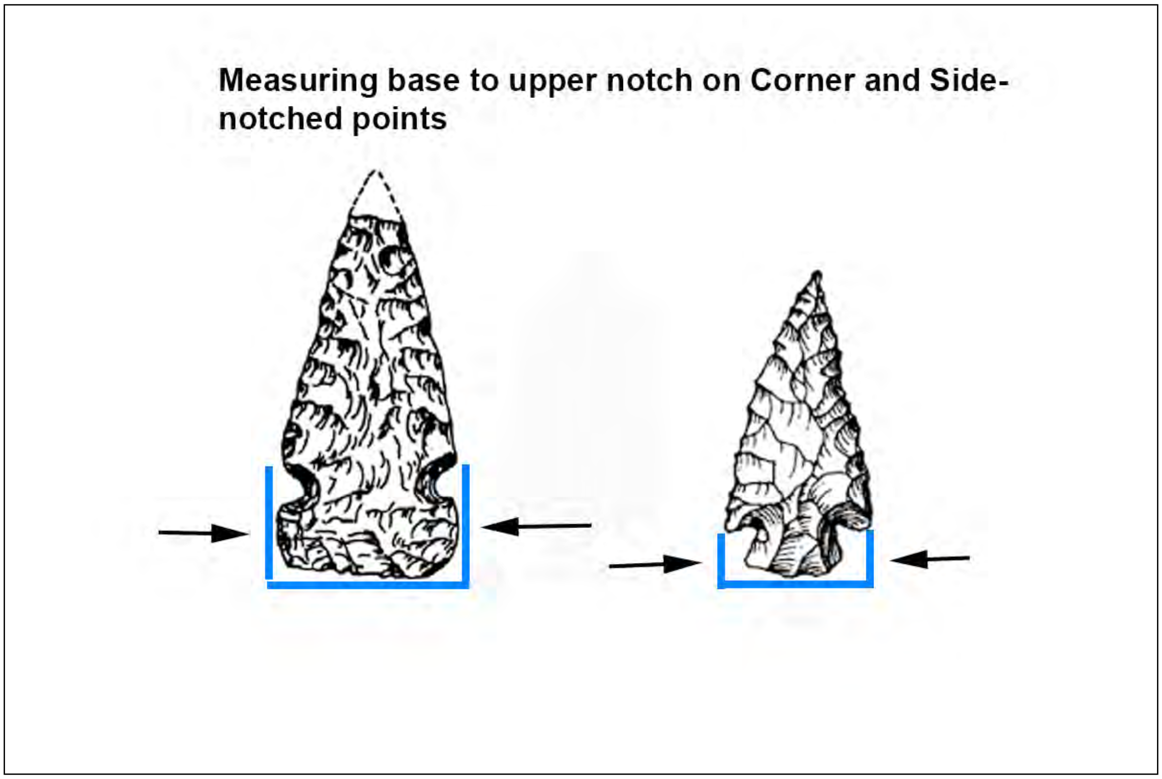
How to measure Extrapolated Measurements. Image modified from Andrefsky (1998:Fig. 7.27).



How to measure Hinge Lengths. Image modified from Geneste and Plisson (1993:Fig. 2).

How to measure Unifacial Spin-Offs.

How to measure Impact Flute Fractures.



Schematic showing how to measure distance from base of point to top of notch area.

Useful Tables

Table summarizing Basgall and Hall (2000) comparison of criteria for Elko and Pinto points.

Pinto Series	Basal width > 10 mm; PSA's ≤100 degrees, or NO ≥80
Elko Series	Basal width > 10 mm; PSA's between 110 and 150 degrees, or NO <80 degrees

REFERENCES CITED

Andrefsky, Jr., William
1998 *Lithics: Macroscopic Approaches to Analysis*. Cambridge: Cambridge University Press.

Barton, R.N.E., and C.A. Bergman
1982 Hunters at Hengistbury: Some Evidence from Experimental Archaeology. *World Archaeology* 14(2):237-248.

Basgall, Mark E. and M. C. Hall
2000 Morphological and Temporal Variation in Bifurcate-Stemmed Dart Points of the Western Great Basin. Journal of California and Great Basin Anthropology 22(2):237-276.

Beck, Charlotte, and George T. Jones

2009 *The Archaeology of the Eastern Nevada Paleoarchaic, Part I The Sunshine Locality*. University of Utah Anthropological Papers 126. The University of Utah Press, Salt Lake City.

Beck, Charlotte, Amanda K. Taylor, George T. Jones, Cynthia M. Fadem, Caitlyn R. Cook, and Sara A. Millward.
2002 Rocks are Heavy: Transport Costs and Paleoarchaic Quarry Behavior in the Great Basin. *Journal of Anthropological Archaeology* 21(4):481-507.

Bergman, C.A., and M.H. Newcomer
1983 Flint Arrowhead Breakage: Examples from Ksar Akil, Lebanon. *Journal of Field Archaeology* 10(2):238-243.

Bement, Leland C.
1991 The Thunder Valley Burial Cache: Group Investment in a Central Texas Sinkhole Cemetery. *Plains Anthropologist* 36(135):97-109.

Bleed, Peter, and Marlene Meier
1980 An Objective Test of the Effects of Heat Treatment of Flakeable Stone. *American Antiquity* 45(3):502-507.

Bradley, Bruce A.
1982 Flaked Stone Technology and Typology. In *The Agate Basin Site*, edited by George C. Frison and Dennis J. Stanford, pp.181-208. Academic Press, New York.

Buenger, Brent A.
2003 The Impact of Wildland and Prescribed Fire on Archaeological Resources. Unpublished Ph.D. dissertation, Department of Anthropology, University of Kansas, Lawerence.

Callahan, Errett
2000 *The Basics of Biface Knapping in the Eastern Fluted Point Tradition*. Lynchburg: Piltdown Productions.

Dockall, John E.
1997 Wear Traces and Projectile Impact: A Review of the Experimental and Archaeological Evidence. *Journal of Field Archaeology* 24(3):321-331

Domanski, Marian, and John A. Webb
1992 Effect of Heat Treatment on Siliceous Rocks Used in Prehistoric Lithic Technology. *Journal and Archaeological Science* 19:601-614.

Fischer, Anders, Peter Vemming Hansen, and Peter Rasmussen
1984 Macro and Micro Wear Traces on Lithic Projectile Points: Experimental Results and Prehistoric Examples. *Journal of Danish Archaeology* 3:19-46.

Flenniken, J. Jeffrey, and Ervan G. Garrison
1975 Thermally Altered Novaculite and Stone Tool Manufacturing Techniques. *Journal of Field Archaeology* 2(1/2):125-131.

Frison, George C.
1978 *Prehistoric Hunters of the High Plains.* Academic Press, Inc., New York.

Frison, George C., and Bruce A. Bradley
1980 *Folsom Tools and Technology at the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque.

Geneste, Jean-Michel, and Hugues Plisson
1993 Hunting Technologies and Human Behavior: Lithic Analysis of Solutrean Shouldered Points. In *Before Lascaux: The Complex Record of the Early Upper Paleolithic*, edited by Heidi Knecht, Anne Pike-Tay, and Randall White, pp.117-135. CRC Press, Inc., Boca Raton, Florida.

Griffiths, D.R., C.A. Bergman, C.J. Clayton, K. Ohnuma, G.V. Robins, and N.J. Seely
1987 Experimental Investigation of the Heat Treatment of Flint. In *The Human Uses of Flint and Chert, Proceedings of the Fourth International Flint Symposium Held at Brighton Polytechnic 10-15 April 1983*, edited by G.D.G. Sieveking and M.H. Newcomer, pp.44-52. University of Cambridge Press.

Heizer, Robert F., and Thomas R. Hester
1978 *Great Basin Projectile Points: Forms and Chronology*. Ballena Press, Socorro, New Mexico.

Hoskins, Andrew J.
2016 *Evaluating the Antiquity and Morphology of Corner-notched Dart Points in the Eastern Great Basin*. Unpublished Masters thesis, University of Nevada, Reno.

Jennings, Thomas A.
2011 Experimental production of bending and radial flake fractures and implications for lithic technologies. *Journal and Archaeological Science* 38:3644-3651.

Lafayette, Linsie M.
2006 Use-Wear Analysis of Great Basin Stemmed Points. Unpublished Master's thesis, Department of Anthropology, University of Nevada, Reno.

Lieberman, Daniel E., and John J. Shea
1994 Behavioral Differences between Archaic and Modern Humans in the Levantine Mousterian. *American Anthropologist* 96(2):300-332.

Miller, Michael J.
2006 An Experimental Study of Lithic Biface Manufacture: Toward Understanding the Perverse Fracture. Unpublished Master's thesis, Department of Archaeology, University of Exeter.

Odell, George H.
1981 The Mechanics of Use-Breakage of Stone Tools: Some Testable Hypotheses. *Journal of Field Archaeology* 8(2):197-209. 2003 *Lithic Analysis.* Manuals in Archaeological Method, Theory, and Technique. Springer Science+Business Media, LLC, New York.

Odell, George H., and Frank Cowan
1986 Experiments with Spears and Arrows on Animal Targets. *Journal of Field Archaeology* 13(2):195-212.

Patterson, Leland W.
1979 Quantitative Characteristics of Debitage from Heat Treated Chert. *Plains Anthropologist* 24(85):255-259.

Purdy, Barbara A., and H.K. Brooks
1971 Thermal Alteration of Silica Minerals: An Archeological Approach. *Science* 173(3994):322-325.

Rick, John W.
1978 *Heat-Altered Cherts of the Lower Illinois Valley: An Experimental Study in Prehistoric Technology*. Northwestern University Archaeological Program: Evanston.

Rick, John W., and Sylvia Chappell
1983 Thermal Alteration of Silica Materials in Technological and Functional Perspective. *Lithic Technology* 12(3):69-80.

Shea, John J.
1988 Spear Points from the Middle Paleolithic of the Levant. *Journal of Field Archaeology* 15(4):441-450.
1991 The Behavioral Significance of Levantine Mousterian Industrial Variability. Unpublished Ph.D. dissertation, Department of Anthropology, Harvard University, Cambridge.

Speer, Charles A.
2010 Understanding the Effects of Heat Treatment of Edwards Plateau Chert. *Ethnoarchaeology* 2(2):153-172.

Titmus, Gene L., and James C. Woods
1986 An Experimental Study of Projectile Point Fracture Patterns. *Journal of California and Great Basin Anthropology* 8(1):37-49.

Villa, Paola, Marie Soressi, Christopher S. Henshilwood, and Vincent Mourre.
2009 The Still Bay Points of Blombos Cave (South Africa). *Journal of Archaeological Science* 36:441-460.

WCRM GROUND STONE LABORATORY MANUAL
NEWMONT LONG CANYON PROJECT

February 2, 2017

TECHNOLOGICAL ANALYSIS OF GROUND STONE

Below, the individual provenience and tool data to be recorded are described in detail in order to permit coding into the database.

Extreme care is necessary when analyzing, coding, and entering data. Every attribute of each artifact is potentially a key component to our ability to interpret behavior on this site. The database is the baseline from which all interpretations and inferences are drawn. **Please be careful and accurate when entering information.** Before washing any ground stone please check with a lab director. We will be considering doing pollen/starch extractions from certain pieces.

In terms of the Research Design, ground stone artifacts are a functional tool type and have been identified as important in addressing the following issues:

- Chronology - as part of a diagnostic tool kit
- Subsistence - based on functional analysis
- Settlement Patterns
- Activity Area Analysis - what happened where?

The ground stone analysis is based on Kolvet and Eisele (2001), Adams (2002), Elston (1979) and modified for our purposes.

Please do not leave any fields blank - if a field does not apply to a certain artifact, put a dash (-) in that space. For example, if an artifact was not point-provenienced, enter a dash (-) in the Prov N/Prov E and Depth fields. However, if a field has a list of selections to choose from, you **MUST** choose one of those selections. If you feel that there is not an appropriate selection for a particular artifact, see the lab director about adding one.

CATALOG NUMBER: This is a number assigned to each artifact and its purpose is to make every data entry unique. Catalog numbers are tracked using the digital artifact inventory; please take care to avoid assigning duplicate catalog numbers.

SCAT NUMBER: This number indicates the catalog number of the bag of debitage where the sample came from. This is critical as it ties the sampled flake back to its original provenience

BOX NUMBER: Number of box where artifact is located. Always write the box number on the bag or envelope so that if the artifact is somehow separated from the collection it may be returned to its original box.

OUTBOX NUMBER: Number of outbox assigned to items sent for outside analysis. These boxes are temporary locations. When the item is returned it should be placed back in its original box.

SPECIMEN NUMBER: This number is assigned when an artifact is sent for outside analyses. If not applicable, enter "-".

ANALYST'S INITIALS (AnInit): Put your initials here.

ANALYSIS DATE (AnDate): The date the analysis was done.

PROVENIENCE DATA

DISCOVERY NUMBER: Enter the discovery number that was assigned to the site. If no discovery number was assigned, enter a dash "-".

AGENCY NUMBER: CrNV-XX-XXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

STATE NUMBER: 26EkXXXX. This field should auto-select based on DISCOVERY NUMBER. You still have to use the drop down menu to select the correct choice.

LOCUS: Enter the locus designation, if applicable.

CONCENTRATION NUMBER (Conc): Enter the concentration number, if applicable.

SHOT NUMBER: Shot number is typically only assigned for artifacts collected using a total station.

BACKHOE TRENCH NUMBER (BHTrench): Enter the backhoe trench number, if applicable.

AUGER TEST: If item was recovered from an auger test, put the number of the auger test from which the item was collected.

SHOVEL TEST: Designation of the shovel test unit, if applicable.

EXCAVATION/TEST UNIT (Ex/Test Unit): Enter the Excavation or Test Unit number, if applicable.

GRID: If the material was recovered from a feature or unit in one of the collection grids, put the grid designation here.

GRID N: This refers to the northing, or the north coordinate, of the southwest corner of the 1 m x 1 m **excavation unit.** The excavation grid coordinates are always justified to the southwest corner which is directly related to the primary collection grid datum which has been given the arbitrary Cartesian coordinates of 100 m north/100 m east. In other words, a unit with a grid north designation of 105 north is five meters north of the primary collection grid datum. Enter only integer values (do not add "N").

GRID E: This refers to the easting, or the east coordinate of the southwest corner of the 1 m x 1 m **excavation unit**. This is encoded just like a north coordinate (e.g., a unit with a grid east designation of 105 east is five meters east of the primary collection grid datum). Use only the integer value.

PROVENIENCE NORTHING/PROVENIENCE EASTING (PROVN/PROVE): Horizontal provenience of a point-provenienced specimen, measured to the nearest centimeter. Provenience will be expressed as meters north and east, i.e. N100.25/E99.35, but only the number needs to be recorded (do not add “N” or “E”). Items collected with GPS units will typically have UTMs associated with them and they should be added to this field as well.

PROVENIENCE ELEVATION (PROV ELEV): Absolute elevation of a point-provenienced specimen, measured to the nearest centimeter relative to the local excavation datum. This field should only be used when PROVN/PROVE are used.

UNIT LEVEL: For excavation units: this refers to the arbitrary 10 cm levels numbered sequentially from the surface. Surface artifacts from excavation units are coded as level “0“. TElev and BElev are the top and bottom elevations of the level.

For surface collected artifacts in 1 x 1 m units within the grids: code as level “0” and put a dash in TElev and BElev. For artifacts collected from the surface throughout the site: code as level “0” and put a dash in TElev and BElev.

UNIT STRATUM: Enter the stratum designation, if applicable. Otherwise enter “-“. If you notice that an artifact from a particular site does not have a stratum entry, but all the others do, then take the time to find the correct data in the appropriate records.

FIELD SPECIMEN NUMBER: Enter the field specimen number.

ANCILLARY FIELD SPECIMEN NUMBER: Enter the field specimen number.

TELEV: The top elevation of the level in which the artifact was located is recorded for excavated artifacts.

BELEV: The bottom elevation of the level in which the artifact was located is recorded for excavated artifacts.

FEATURE NUMBER: Feature number, if artifact is from a feature. Otherwise enter “-“.

FEATURE PORTION: Horizontal provenience of the feature, e.g. N1/2 or NE1/4.

FEATURE LEVEL: this refers to the arbitrary 10 cm levels numbered sequentially from the origin (or truncated surface) of the feature.

FEATURE STRATUM: stratum designation assigned to feature depsosits.

GROUND STONE DATA

CONDITION: Condition of specimen in terms of completeness.

> **Complete.** If the artifact appears to be complete enter as complete.
> **Incomplete.** Ground stone tools that are missing parts. For example, a metate fragment that was radially broken and is missing a portion of its use surface and/or margin.
> **Indeterminate.** Use sparingly.

ARTIFACT REFIT:

- **Not part of a refit**
- **Part of a refit**
- **Refitted artifact**

OXIDATION: Does the artifact display discoloration due to oxidation? The analyst should check for red or black discoloration that is NOT residue.

- **Yes**
- **No**
- **Indeterminate**

FIRE CRACKED: Is the artifact broken as a result of being fire affected?

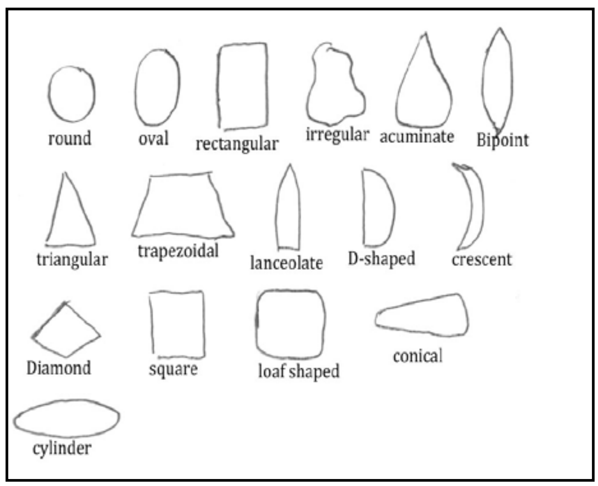
- **Yes**
- **No**
- **Indeterminate**

ERODED/WEATHERED: Has the artifact been eroded or weathered as a result of natural processes?

- **Yes**
- **No**
- **Indeterminate**

SHAPE IN PLAN VIEW (SHPPLN): describes the general shape of the artifact in plan view. Adams (2002:233) notes that it is most useful for remembering specific artifacts and has little analytical value (***note: use Indeterminate for fragmentary ground stone***).

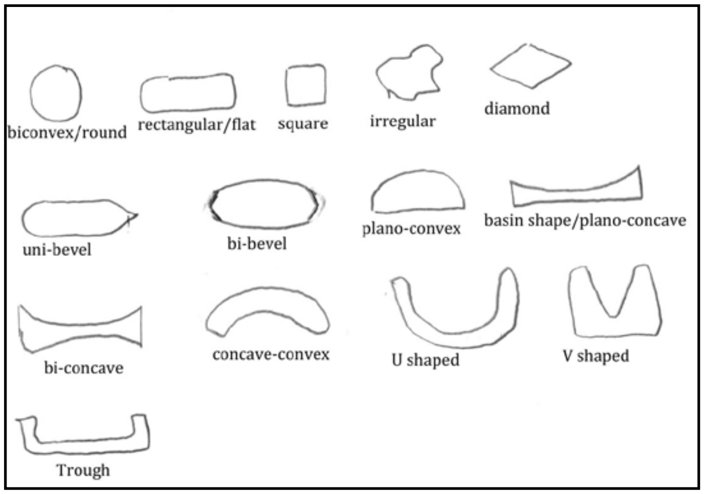
- **Round**
- **Ovate**
- **Rectangular**
- **Irregular**
- **Acuminate**
- **Bipoint**
- **Triangular**
- **Trapezoidal**
- **Lanceolate**
- **D-shaped**
- **Crescentic (crescent shaped)**
- **Diamond**
- **Square**
- **Loaf Shaped (rectangular with rounded corners)**
- **Conical**
- **Cylinder**



- **Indeterminate**

SHAPE IN CROSS-SECTION (SHPXS): (***note: use Indeterminate for fragmentary ground stone***).

- **Round/Biconvex**
- **Rectangular**
- **Square**
- **Irregular**
- **Diamond**
- **Beveled (one edge)**
- **Bi-beveled**
- **Plano-convex**
- **Plano-concave**
- **Biconcave**
- **Concave-convex**
- **U-Shaped**
- **V-shaped**
- **Trough**
- **Triangular (not illustrated)**
- **Trapezoidal (not illustrated)**
- **Indeterminate**



TEXTURE (TXT): Use a 10x hand lens and a scale to determine texture.

- **No Texture:** No macroscopically visible grains
- **Fine:** < 1 mm grains
- **Medium:** 1-2 mm grains
- **Coarse:** 2-4 mm grains
- **Conglomerate:** >4 mm grains

VESSICULES (VSC): Use a 10x hand lens and a scale to determine approximate average size of vesicles.

- **Small**: <2 mm
- **Large:** > 2 mm
- **Mix:** vesicles small and large
- **Not applicable or Indeterminate**

MATYP: Material type of specimen

Volcanic Rocks

Phaneritic Texture: These igneous rocks have grains of nearly equal size and are visible to the naked eye.

- **Granite:** medium grained, all crystalline rock with black biotite, pink feldspar and gray quartz.
- **Gabbro:** is an all crystalline rock with hornblende, soda-lime feldspars and no quartz.
- **Granodiorite:** Medium to coarse grained, all crystalline rock with feldspar, quartz, hornblende, and biotite constituents. It is distinguished from granite by a higher proportion of interlocking or twinned plagioclase crystals.

Porphyritic Texture: These rocks have mineral grains of two distinct sizes.

- **Rhyolite porphyry**: Contains larger feldspar crystals in an aphanitic groundmass of alkali feldspar and quartz.

- **Trachyte porphyry**: A coarse-grained crystalline rock composed of potash feldspar crystals in a light colored aphanitic mass.

- **Diorite**: A speckled, coarse-grained igneous rock consisting essentially of plagioclase and hornblende or other mafic minerals.

Aphanitic texture (microcrystalline): These rocks have mineral grains too small be seen with the naked eye. Note generally speaking most of these rocks need to have their name determined by examination either with a polarizing microscope or by analysis of geochemistry. Because of this it is more useful in the laboratory to divide them into two general categories.

- **Aphanitic Light Color or "Felsites"** (white, light and medium gray, yellow, light and medium green, reds, purples, and browns) colored aphinites or light "FGVR". Included here are the rocks:
    - **Andesite/FGVR**: A microcrystalline light-colored rock commonly containing plagioclase and sometimes hornblende and biotite. The rock is slightly porphyritic in nature.
    - **Rhyolite/FGVR**: A light colored rock generally containing micro-crystalline potassium feldspar, quartz and sometimes plagioclase and biotite.
    - **Trachytes, latites and some dacites**

- **Aphanitic Dark Color or "Mafites"** (dark gray, dark green, black and brownish black). Included here are the rocks:
    - **Basalt/FGVR** (Fine Grained Volcanic Rock): A microcrystalline dark colored lava rock.
    - **Vesicular/FGVR Basalt**: Same as above with vesicles.
    - **Dacite/FGVR**: An igneous rock containing andesite but with free quartz.
    - **Picrites:** dark basalt rich in olivine
    - **Tephrites**
    - **Basanites**

Aphanitic texture (glassy): These rocks are composed of glass like materials.

- **Obsidian**
- **Pumice**
- **Scoria**
- **Volcanic Rock Indeterminate**

Clastic Sedimentary Rocks: These rocks are formed by mechanical weathering.

- **Conglomerate**
- **Sedimentary Breccia**
- **Sandstone**
- **Siltstone**
- **Mudstone**
- **Shale**
- **Limestone/Bioclastic Limestone**
- **Orthoquartzite or Quartzitic Sandstone**

Chemical Sedimentary Rocks: During the process of weathering rocks may be dissolved and when the solution cools or evaporates the solid portion is deposited as a precipitate. These rocks are referred to as chemical rocks.

- **Chert -** can be formed either chemically or from biologic deposition.
- **Chalk**

- **Tufa**
- **Travertine**
- **Gypsum**
- **Limonite**: Can be used to make "yellow ochre" or "red ochre".

Metamorphic Rocks: Generally formed by recrystallization in the solid state by pressure and heat. They are divided into two major divisions of foliated (layered) and non-foliated rocks.

Foliated Rocks include:
- **Phyllite**
- **Slate**
- **Gneiss**
- **Mica Schist**
- **Chlorite Schist**
- **Talc Schist**

Non-Foliated rocks include:
- **Metaquartzite**
- **Serpentine**
- **Hornfels**
- **Argillite**
- **Marble**

Minerals:
- **Hematite**: Common red hematite does not appear crystallized (although minutely crystalline). The mineral is dull without metallic luster, dark red and opaque.
- **Cinnabar**: Cinnabar is most common in a fine, granular, massive form. The mineral HgS displays perfect prismatic cleavage, a Mohs hardness of 2.0–2.5, and a density of 8.09. It has either an adamantine luster and vermilion red color or a dull luster and brownish-red color. The mineral is commonly used for pigment.
- **Quartz**
- **Calcite**

Other Rock Types:
- **Other** (specify type in comments)
- **Indeterminate/Unknown**

MANUFACTURE

MANUFACTURING (MAN) is an attempt to record the location and nature of damage created by **manufacturing** (*don't consider use-related modifications*). Categories can be added as needed. The purpose is to get you to thoroughly examine the artifact and decide if is of expedient or strategic design (Adams 2002). You will select up to three manufacturing methods (if necessary) to describe the artifact. <u>The first one should be the most obvious and/or take up the largest percentage of the tool.</u> **Consideration should be given to do high power microscopic examination of all ornaments to determine manufacturing and polishing methods and degree of use and cord wear.**

MAN 1.__________________MAN 2.__________________MAN 3.__________________

- **Manufacture Absent:** The artifact was formed by use-wear only.
- **Carved**: Shaping by deliberate cutting (not from use-wear).
- **Flaked**: Evidence for the removal of flakes by percussion.
- **Grinding:** Evidence for grinding on surface.
- **Pecking**: Evidence for surface pecking.
- **Ground Edge/Perimeter only**: Evidence for edge grinding.
- **Ground and Incised:** Evidence for deliberate grinding as well as deliberate incisions to shape (cutting) (not from use).
- **Flaked and ground**: Evidence for the removal of flakes followed by grinding.
- **Flaked, ground and polished:** Evidence for the removal of flakes, followed by grinding and polishing (must display obvious manufacture related polish – not use).
- **Pecked and ground**: Evidence for pecking and grinding only
- **Flaked, pecked, and ground**: Evidence for all three
- **Flaked, pecked, ground, and manufacture polish**: Evidence for all four.
- **Pecked, ground and manufacture polished**
- **Pecked to establish comfortable holding area**
- **Flaked to establish hafting/holding area**
- **Pecked to establish hafting/holding area**
- **Pecked and ground to establish hafting/holding area**
- **Ground for stability**
- **Pecked for stability**
- **Pecked to establish concavity**
- **Ground and pecked for stability**
- **Ground and drilled**
- **Ground, manufacture polished and drilled**
- **Sawn:** The artifact displays evidence for having been modified by sawing.
- **Pecked design element:** The artifact exhibits evidence for creation of a pecked design element.
- **Abraded design element:** The artifact exhibits evidence for a design element created by abrasion (also includes relief carving techniques).
- **Incised design element:** The artifact exhibits lines from deliberate incision to create design elements. Note that there is a supplementary form for incised stones that includes an in depth verbal description, illustration and photograph.
- **Indeterminate**

DESIGN (DSN) Records whether an artifact is expediently or strategically designed. If the only manufacturing evidence is on the use surface, it is expediently designed. In other words, if the artifact displays only evidence for being formed by use then it is expedient. If there is additional shaping to make a tool comfortable to hold, to create a shape not essential to its function, or to improve its appearance, then it is strategically designed.

- **Expedient**
- **Strategic**
- **Incomplete**
- **Indeterminate/ or "-" for not applicable**

USE/USE WEAR

NUMBER OF USED SURFACES (SNO) keeps track of the location and orientation of the used surfaces. This is not applicable to all artifact types. Please describe two or more use surfaces in comments.

- **One**
- **Two**
- **Three**
- **Four**
- **Five**
- **Six**
- **Seven**
- **Eight**
- **Indeterminate/ or "-" for not applicable**

USE1 records the primary use category and **USE2** records the secondary use category (if applicable). If there is no secondary use category, enter "-".

USE 1.__________________USE 2._________________

- **Single Utilitarian Use**: Used only in the activity for which the tool was designed.
- **Multiple Utilitarian Use**: Designed for use in more than one task/activity.
- **Redesigned** (Multiple Use-loss of primary use): Redesigned for secondary use and may not be usable for the artifacts original function.
- **Recycled**: These items are designed and used in one activity but then used for a completely different use. The secondary use may or may not result in alteration of the item.
- **Offering/Ritual**: The artifact was recovered in a context which is indicative of its primary use was as an offering.
- **Non-Utilitarian Primary Use for Display/Status**: The artifacts primary use is thought to have been for display or to confer status.
- **Not Used**
- **Indeterminate**/ or "-" for not applicable

INTENTIONAL BREAKAGE (INTBRK)

- **Killed/removed**: The artifact displays evidence for deliberate removal from use as a ritualistic act. For example, a metate that shows clear evidence of percussive impact that (in the analyst's opinion) renders it useless.
- **For shaping/transport**: The artifact appears to have been intentionally broken in an effort to shape it for use and/or transport. For example, a metate that shows percussion or pecking around the perimeter to create a deliberate shape or to reduce mass.
- **Indeterminate/ or "-" for not applicable**

USE LEVEL (USL) standardizes the amount of use-wear the tool as a whole has received. If the item has several use-wear locations which may be indicative of multi-functional use, choose the use-wear area that comprises the most surface area for quantification below and briefly discuss the other use-wear in comments.

- **Light**: This should be used to categorize those tools that only demonstrate very slight use modification and in order to be confident in your assessment you need to use either oblique lighting, a hand lens or low power stereomicroscope. An example would be a hammerstone with only several impact scars or a netherstone with very light grinding (i.e. no basin formation).
- **Moderate**: This category is used to categorize those tools which display significant use-wear. These wear patterns can be distinguished without specialized lighting and or magnification. An example would be a hammerstone with readily apparent multiple impact events or a metate or mano with readily identifiable surface modification and readily perceivable reduction in mass of the artifact caused by abrasion.
- **Heavy:** This category is used to categorize those tools that clearly have been used for more than a single "event". An example would be a hammerstone with significant mass reduction from hundreds of impacts or an extensively used and worn metate or mano.
- **Nearly worn out:** This category is used to categorize those tools where the analysts perceives is within one use event of being expended. An example would be a hammerstone with only one small functional area left or a metate that is a mm or two from being worn out.
- **Worn out**: This category is used to categorize those tools that are clearly totally expended and have been discarded.
- **Unused or wear not perceivable by macroscopic observation**
- **Indeterminate/ or "-" for not applicable**

POLISH LEVEL (POLV) is a subjective visual analysis of any use polish present on the artifact. Assigning the polish to one of the below levels can help the analyst determine an artifact's use.

- **Polish Level 1**: The surface is extremely smooth and obviously flattened by abrasion. Much of the surface reflects light to a very high degree. This type of morphology can be formed from stone on stone contact with or without an in-between medium (i.e. plant material).
- **Polish Level 2**: The surface is smooth but <u>NOT</u> obviously flattened by abrasion and much of the surface reflects light to a high degree. This type of morphology can be formed from soft material contact (i.e. hides).
- **Polish Level 3**: The surface exhibits patchy areas of polish on a surface area obviously flattened by abrasion.
- **Polish Level 4**: The surface exhibits patchy areas of polish on a surface area that does not appear to have been flattened by abrasion.
- **Indeterminate/ or "-" for not applicable**

USE-WEAR ASSESSMENT FOR HIGH POWER MICROSCOPY (UWHP)
Recent research has demonstrated that it is sometimes possible to determine what grinding stones ground by using high power microscopic techniques of observation potentially coupled with Polyvinyl siloxane peels of the surface (Liu, et al. 2010a; Liu, et al. 2010b). These techniques could help us distinguish grinding slabs used to manufacture stone tools, hide rubbers and plant processing surfaces. Because this procedure is time intensive, your comments will help us determine artifacts worth sampling. In order to help us make this determination please make the following observations. Determination of polish/sheen will require good lighting such as oblique fiber optic (not ring light).

UWHP-1: Is the used surface very smooth (surface grains flattened by use does not catch fingernail in most areas) with a very distinct sheen/polish that is restricted to the use-area?

- **Yes** (if yes, below must be no)
- **No**
- **Indeterminate/ or "-" for not applicable**

UWHP-2: Does the use surface appear to have rounded grain structure, with more of a "rougher" feel (catches your fingernail) with a less pronounced to very subtle polish restricted to use-area?

- **Yes** (if yes, above must be no)
- **No**
- **Indeterminate/ or "-" for not applicable**

UWHP-3: The surface appears smooth and polished, but this appears to be due primarily to the nature of the raw material and/or natural processes and perhaps not related to use-wear.

- **Yes** (if you check yes, above must both be no)
- **No**—I answered yes or indeterminate to one of the above two questions.

UWHP-4: Is the artifact larger than a coke can?

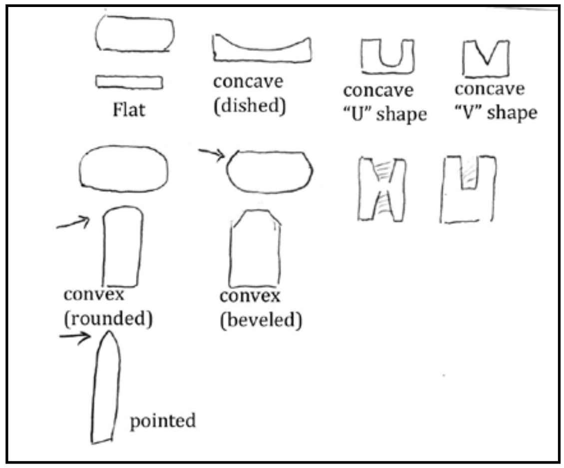
- **Yes**
- **No**
- **About the same size** (more or less)

RESIDUES (RSD) helps keep track of pigment, clay, carbon, and other residues on use surfaces.

- **No residue**
- **Carbon**
- **Clay**
- **Probably organic**
- **Some type of pigment**
- **Indeterminate/ or "-" for not applicable**

SHAPE OF PRIMARY USE SURFACE IN CROSS-SECTION (USEX): See below illustration

- **Flat**
- **Concave (dished)**
- **Concave (U-shaped)**
- **Concave (V-shaped)**
- **Convex (rounded)**
- **Convex (beveled)**
- **Biconical Perforations**
- **Cylindrical Perforations**
- **Pointed (i.e. awl, axe)**
- **Other**
- **Indeterminate/ or "-" for not applicable**



IMPLIED ACTIVITY (IACT) This variable is concerned with the activity in which the artifact was actually used. The artifacts described in the manual are sorted into activity categories. Please select the one that best describes the artifact in question. If more than one activity appears to have taken place, enter the primary activity in the **IACT1** field, and the secondary activity the **IACT2** field.

IACT1.___________________IACT2.__________________

- **Food processing**: A reasonable assumption can be made that the artifacts primary use was to process food (i.e. mano, metate, nutting stone)
- **General processing**: The specific use of the artifact is not clear, but more than likely it was used to process food or animal products (i.e. large "netherstone" or slab metate.
- **Food Container/Lid**: Artifacts that are thought to have been used to contain food. Examples are bowls, lids, trays, and censers.
- **Percussion/Chopping/Pulverize:** The principal use was to chop or strike.
- **Abrading/Grinding:** The principal use was to abrade or grind.
- **Polishing/Burnishing:** The principal use was to polish or burnish stone or ceramic objects. If it is clearly a ceramic burnishing stone use below.
- **Manufacture-pottery:** These items would include definite burnishing stones and pottery anvils.
- **Cutting:** The principal use was for cutting a non-specified material.
- **Sawing:** The principal use was for sawing (i.e. tabular slice saw) a non-specified material.
- **Scraping:** The principal use was for scraping a non-specified material.
- **Perforating/Spinning:** This includes spindle whorls and non-flaked drill bits.
- **Digging:** This includes "donut stones" or dig stick weights.
- **Ornamentation:** Artifacts such as beads, plugs, pendants, etc.
- **Representation:** This includes items such as zoomorphs.
- **Hunting:** This includes artifacts such as atlatl parts and sling stones.
- **Fishing**: This includes net sinkers.
- **Gaming:** This includes items that are thought to be gaming pieces. Examples from Adams (2002) include "kickballs", possibly "cruciforms", and "disks".

- **Music Making:** These artifacts are thought to have been modified to create music. Adams (2002) describes examples of "bellstones", "ringing stones", and "gongs".
- **Structural:** Although not an "activity" some artifacts are thought to have been built into structures or features (Adams 2002:226). These would include loomblocks, cooking stones, griddles, pikistones, firedogs/trivets and fire cracked rock.
- **General processing-pigment**: The artifact must display pigment residue. Examples are handstones or netherstones with pigment traces.
- **Hide Working**: High power use-wear suggests hide working activities.
- **Bone Working**: High power use-wear is indicative of bone working activities.
- **Wood Working**: High power use-wear is indicative of wood working activities.
- **Ritual/symbolic/decorative**: An artifact that was used in ritual. This would include items such as white quartzite "lightning stones" and incised stones.
- **Smoking:** This would include stone pipes and tubes.
- **Other**: Specify in comments.
- **Unused**
- **Indeterminate/ or "-" for not applicable**

Is the artifact a good candidate for outside analysis? If yes, check the box in the database and explain why in the comments.

Good candidates for outside analysis would be those items that were buried, are covered in sediment and/or pigment, or items like anvils that have the potential for protein on their surfaces.

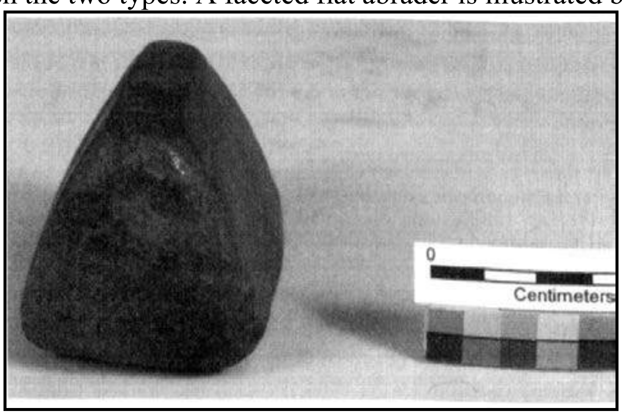
ARTIFACT TYPE/USE

ARTIFACT TYPE (ARTYP): For this analysis, ground stone includes artifacts related to milling, pounding/pulping, pigment processing, perforation (drill spindle receptacle, flywheels), abrading/polishing/grinding, as well as ritual/esoteric items and ornaments made of stone or other perishable materials.

Active Elements (Handstones, Manos, and Pestles): According to Adams (2002), a handstone is a generic label for all handheld stones. Within this generic set are abraders, smoothers, polishers, and hide processing stones as well as manos and pestles. Adams (1988; 1989; 1997; 2002) considers manos and metates to be two components of *food* processing equipment. Those handstones specifically designed for processing non-food items **are not** classified as manos and were worked against netherstones, not metates.

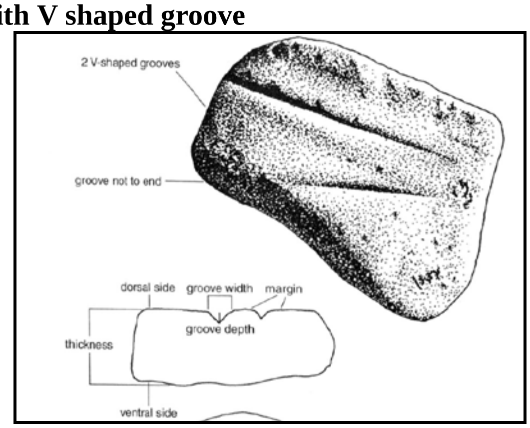
HANDSTONES:

- **Flat Abrader**: These are active elements and have a "broad working surface on stone coarse enough to remove material from the contact surface". Adams distinguishes between wedge shaped flat abraders and faceted flat abraders which have a triangular profile with a flat facet (Adams 2002:81). As she does not illustrate a "wedge" shape abrader we will not try to distinguish between the two types. A faceted flat abrader is illustrated below.



An example of a faceted flat abrader (after Adams 2002:Figure 4.2).

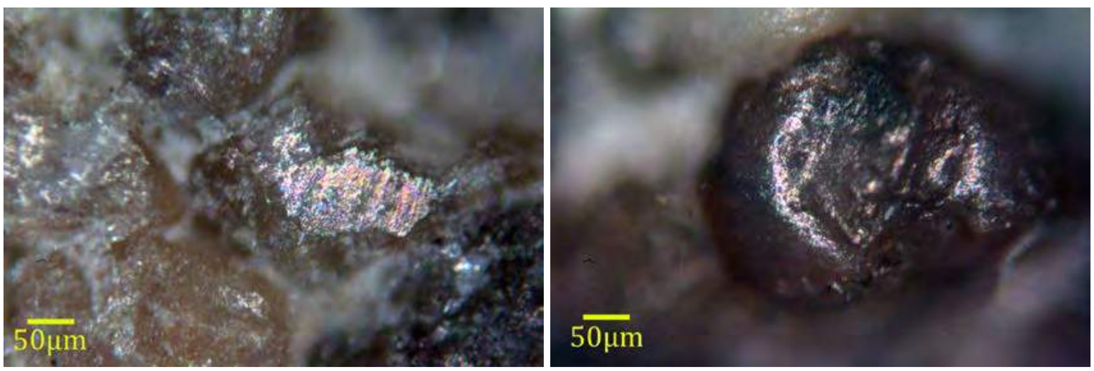
- **Grooved Abrader with V shaped groove**



An example of a grooved abrader with a V shaped groove (after Adams 2002:Figure 4.3).

- **Grooved Abrader with U shaped groove**: Probable shaft straightener.

- **Probable Ceramic Burnishing Stone**: Small round pebble with a distinct polish. They are chosen for their smooth surfaces. Typically, burnishing stones ***will not*** have pronounced facets but will have well developed polish. When they only have been used for hours they still exhibit considerable topography and the polish in many ways will resemble a hide polish wrapping into the crevices in the surface. Burnishing stones that have been used for years and possibly handed down generations will have the topography flattened. Striations/linear features may be present on the surface of the stone. These tools should be examined under high power microscopy. **See examples in type collection.**
- **Probable Stone Polishing Stone:** A pebble with a distinct facet and high polish created by contact with another stone. The surface topography is flattened even after minimal use and generally the surface is extremely reflective and striations are common. These tools should be examined under high power microscopy. **See examples in type collection.**
- **Possible Hide Rubbing Stone:** There is much world-wide ethnographic evidence that document the use of stones to soften or remove hair, soften or apply tanning agents during the preparation of hides. You might be able to recognize a hide rubbing stone by a slightly "rougher" surface texture as the topography has not been leveled by stone on stone contact. A polish might be observable at lower power with oblique lighting (not ring light) on the rounded grains if the stone was used for a long time. Probable hide rubbing stones should be examined under high power microscopy and compared to type collection. Determining what may constitute a hide rubbing stone is no easy task without using high power microscopy.

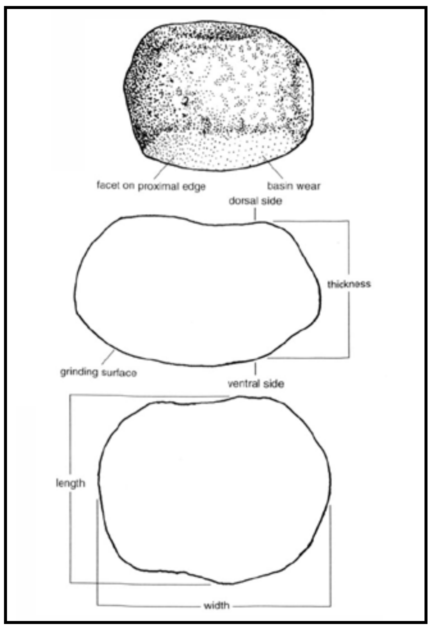


Surface of sandstone grinding slab used to grind stone tools (left). Note the flat facet of the quartz grain and associated bright stone on stone polish. Surface of sandstone used to rub moose hide for 40 minutes (right). Note the non-flattened grain and polish wrapping around into the region between the grains.

- **Pigment Grinding Pebble or Cobble:** This artifact is identified by residue of iron/mercury or other readily identifiable material adhering to the surface. Care should be taken not to wash the surface and consideration should be given to residue analysis.
- **Generic Expedient Handstone.** The tool is not shaped but shows some wear from grinding (either unifacial or bifacial). However, it cannot be determined if the tool was used on a metate.
- **Indeterminate/Fragmentary:** Probable handstone
- **Other Handstone** (Please specify in comments, see Lab Supervisor before using this designation)

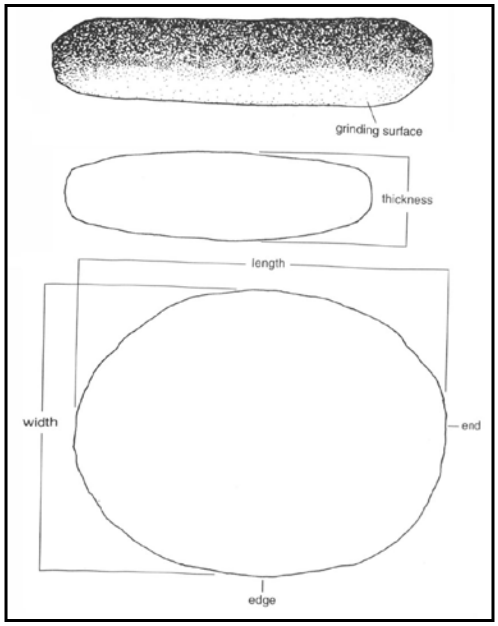
MANOS: According to Adams (2002:100), a technological classification of manos refers to metate designs which are classified "according to the configuration of their grinding surfaces rather than by overall shape."

- **Expedient unshaped mano with unifacial wear only.** The wear should be indicative of wear from a metate or the artifact should have association with a metate. Otherwise enter as generic handstone**.**
- **Expedient unshaped mano with bifacial wear.** The wear should be indicative of wear from a metate or the artifact should have association with a metate. Otherwise enter as generic handstone.
- **Mano with deliberate shaping of edges/faces with unifacial wear:** If one of the below types 19, 20 or 21 apply, don't use this category.
- **Mano with deliberate shaping of edges/faces with bifacial wear**: If one of the below types 19, 20 or 21 apply, don't use this category.
- **Basin Mano**: These are used with a basin metate and manipulated with some combination of circular and reciprocal strokes (see discussion in Adams 2002:100). Basin manos manipulated with circular rocking strokes have wear facets on parts of their ends and edges and multidirectional striae on their surfaces (see below illustrations and Figure 5.4 in Adams 2002:104).



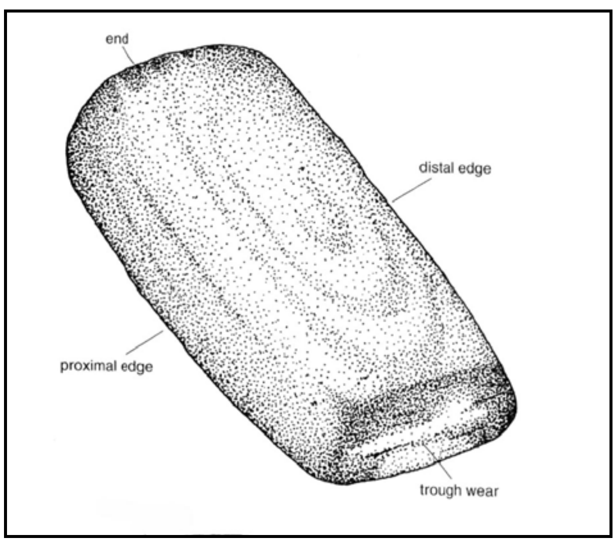
A reciprocal rocking stroke results in wear facets on the proximal and distal edges of a basin mano (from Adams 2002:Figure 5.4).

- **Flat/Concave Mano**: These are generally longer, with a flatter grinding surface than those of basin manos, but not as long as the metate is wide. Flat, reciprocal strokes keep a mano's surface in contact with the metate surface at all times (see below illustrations and Figures 5.5 and 5.6 in Adams 2002:105, 107).



A flat to slightly concave mano with wear patterns from use in a slightly concave basin (after Adams 2002: Figure 22).

- **Trough Mano**: These are used with a trough metate and moved only in a back and forth "reciprocal stroke" manner. They can be identified by distinct wear on the ends from rubbing against the trough walls. All evidence of original manufacture is often obliterated by subsequent wear. (see below illustration).



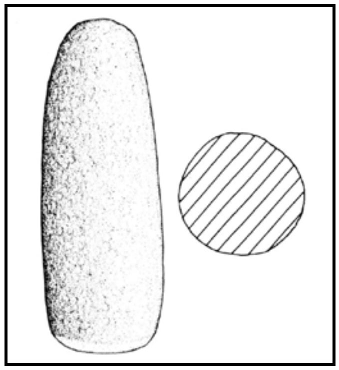
Trough mano with lateral wear patterns from contact with the sides of trough (from Adams 2002:Figure 5.9).

- **Indeterminate/Fragmentary Probable Mano**: A mano that cannot be fit into another category. This is the "indeterminate" category as well.

- **Other Mano**: (Please specify in comments, see Lab Supervisor before using this category)

PESTLES: A pestle is the upper stone used in conjunction with a mortar. However, they may also be used in tasks away from the mortar. Usually made from unshaped, elongated cobbles, the tool was used to pulverize various materials. Some are pecked and abraded and others are not. The size and shape roughly corresponds to the diameter and depth of the mortar. May be ground on one or more surfaces and ends may or may not show evidence of pounding. Categories for pestles are distinguished by the description of the cross section of the working end with the majority of the use attrition and include: flat; arc-shaped; beveled; or rounded.

- **Conical or cylindrical shaped pestle with a flat end**
- **Conical or cylindrical shaped pestle with a round/arc shaped end**
- **Conical or cylindrical shaped pestle with a beveled end**
- **Expedient cobble pestle with un-worked sides**



An example of a conical, dressed rounded pestle (after Olsen and Payen 1983:Figure 15).

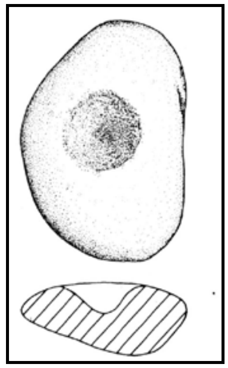
- **Indeterminate/Fragmentary probable pestle**
- **Other pestle:** Please specify in comments. See Lab Supervisor before using this category.

Passive Elements (Netherstones and Metates): Adams (2002:98) notes that "netherstones" is the label for the set of all bottom stones upon which substances or items are altered. In a generic sense, netherstones comprise a large set within which tools such as metates, mortars, lapstones, lithic anvils and others are subsets. Metates are considered to be the passive component of food-processing equipment.

NETHERSTONES:

- **Netherstone/Lapstone:** This category is used as a general catch all when a "bottom stone" cannot be placed into a more formal category. Lapstones are handheld netherstones.
- **Pigment Grinding Slab/Stone ("Informal" Palette)**: This is an expedient "lapstone (small netherstone)" that shows evidence in the form of probable pigment residue.
- **Lithic Anvil:** These artifacts are the bottom stones generally thought to have been used during bipolar reduction. As such, they would need to absorb a very hard striking blow. Small thin tabular pieces generally should not be considered lithic anvils.
- **Fragmentary/Indeterminate probable Netherstone and/or Lapstone:** Lapstones are handheld netherstones. This category can be used for small fragments of ground stones that have one or more obvious flattened surface from grinding.

- **Pitted Stone ("Nutting Stone"):** Ethnographically documented as a small stone with a depression in which nuts could have been opened. Care should be taken to observe what types of use wear patterns are present in the depression. If one observes circular patterns, the artifact may represent part of a spindle drilling kit.

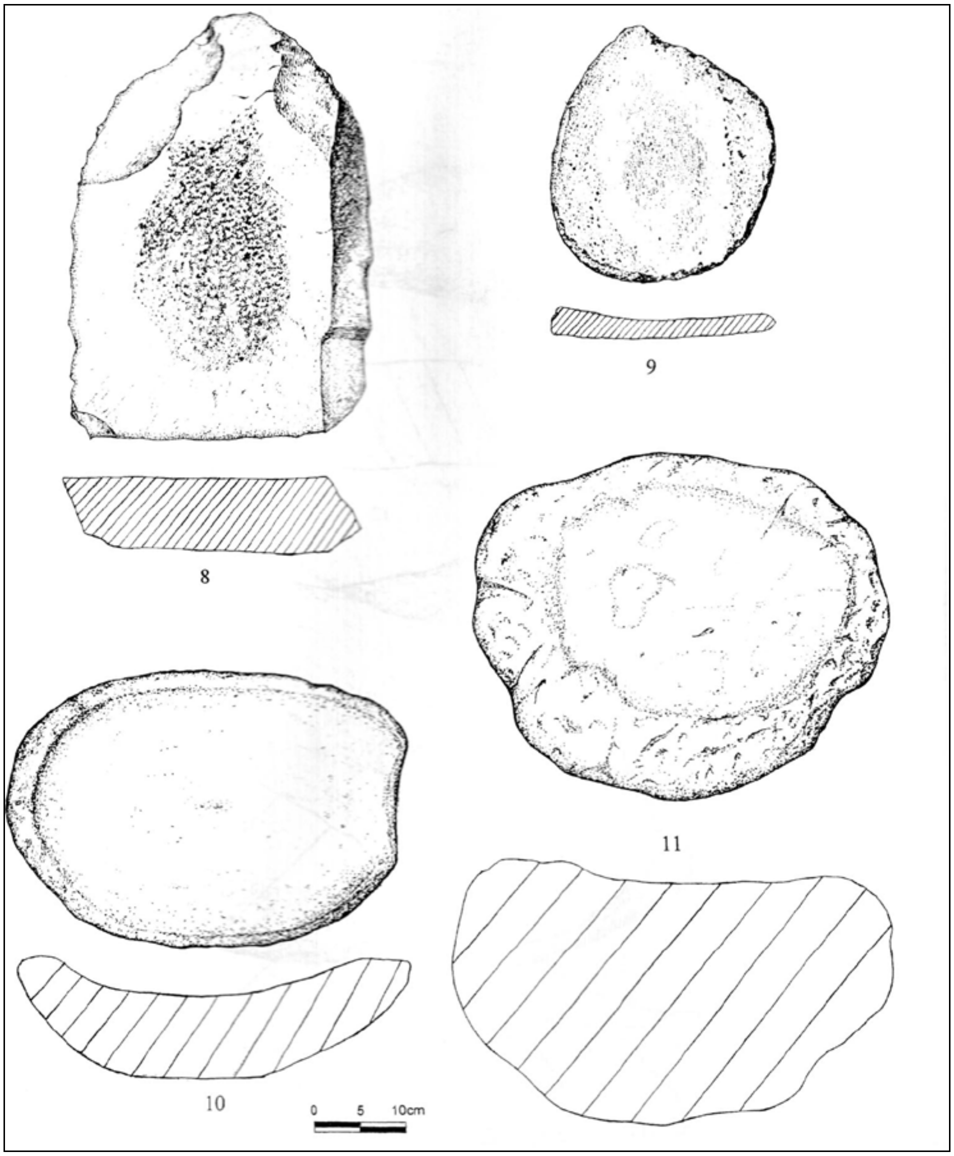


An example of a probable "nutting stone" (after Olsen and Payen 1983:Figure 20).

- **Other Netherstone:** (Please specify in comments, see Lab Supervisor before using this category)

METATES:

- **Block:** These are tabular or slab shaped and too large to be handheld. They are usually made from a tabular stone boulder. Use surfaces are usually unifacially ground and the bottoms are relatively flat. The grinding surface is usually "closed" (surrounded on all sides) and small in comparison to the total block surface area. Wear consists primarily of parallel striae rather than circular or random. Block metates are usually thick (>45 mm) and grinding basins range from a couple of mm to over 10 mm in depth.
- **Flat Concave:** Metates that are used with manos shorter than the metate width. They start with flat surfaces but can become basin shaped through use (Adams 2002:103). They are usually thinner than block metates. Slab metates have thin cross-section generally less than 5 cm in thickness (Kolvet and Eisele 2001:40) and are rarely thicker than about 30 mm and are often transported. Most are unifacially ground but are more apt to be bifacially ground than block metates.
- **Basin:** The grinding surfaces are circular or elliptical (Adams 2002:100). Basin metates are different from flat/concave metates as their basins are intentionally shaped (although evidence may be long removed from use) by smaller and rounder basin manos using combination of circular and reciprocal strokes (Adams 2002:100-103).
- **Three-Quarter Basin:** These are basin metates that are open on one end.
- **Open Basin:** These metates are open on both ends.
- **Boulder**: Elston (1979:144) defines these non-portable metates as being irregular in shape, constructed from large and/or flat river boulders and typically do not have any edge modification.
- **Closed Trough:** Trough metates have intentionally manufactured rectangular basins. Their associated manos move only in a back and forth manner. A closed trough has borders on both sides and both ends.
- **Open-Trough**. These are trough metates that have borders only on the sides. Both ends are open.
- **Three-Quarter Trough**. These trough metates have borders on both sides and one end.
- **Fragmentary/Indeterminate probable Metate**
- **Other Metate**. (Please specify in comments, see Lab Supervisor before using this category).



Examples of block metate (#8), slab metate (#9), basin metate (#10) and a boulder metate (#11) (after Kolvet and Eisele 2001:Figure 15).

MORTARS: Mortars are used with pestles to process an assortment of items by pounding and grinding. The mortar types identified at the Bordertown sites are appropriate for this analysis (Elston 1979).

- **Conical Mortars**: Elston found that these were made in fist-sized cobbles to head-sized boulders with relatively shallow wells ranging in depth from approximately 7.0 mm to 23.5 mm). May also be biconical (wells pecked into opposing faces).
- **Bowl Mortars**: These are made on spheroid, head-shaped cobbles of granite or FGVR. Bowl mortars are bowl shaped, usually with deep wells ranging in depth from approximately 2.7 to 9.3 cm, and have large diameters (6.2 to 13.3 cm). The wells are fashioned by pecking then worn smooth through use.
- **Hopper Mortars:** These are made on cobbles with one relatively flat working surface. Worked areas are generally slightly concave with a pecked or battered surface. Hopper mortars were probably used in conjunction with flat to slightly convex pestles or mauls and bottomless baskets, attached to the mortar surface with pitch.
- **Disk Mortar:** A mortar created in a disk shaped stone.
- **Fragmentary Indeterminate Mortar**
- **Other Mortar** (Please specify in comments, see Lab Supervisor before using this)

<u>Other Ground Stone Tools</u>

PERCUSSION TOOLS: According to Adams (2002) the purpose of percussion tools is chip or smash away unwanted parts of other items. Percussion tools include hammerstones, pecking stones, choppers, chisels, and crushers. Please note that since chisels and choppers are modified through flaking to create an edge, they are analyzed as chipped stone tools (See manual for Phase IV).

- **Hammer or Pecking Stone:** These tools are almost always defined by use-wear only. They can be used in light duty percussion activities such as shaping manos and metates and renovating worn grinding surfaces to having extensively battered edges from the production of numerous tools. Striations may be present from platform preparation by edge abrading. Hammerstones are generally round or ovate in shape. Pecking stones may have more of a pronounced projection (not always).
- **Crushers:** These tools were used against netherstone to reduce intermediate substances and are generally defined by use-wear only. ***The artifact type is defined by context and must be found in association with a netherstone.***
- **Angular Abraders**: This is a percussion tool that has been subsequently abraded. These battered angular tools have sometimes been referred to as "hammer grinders" (personal communication with Tim Kearns, March 24, 2004). They must show clear evidence for impact damage and grinding.

HULLERS: Hullers are flat, tabular stones that appear as "mini-metates". They are usually quite thin (<2 cm), although dimensions may vary regionally, according to available raw materials. Ethnographies indicate that they were used to crack the hulls of pine nuts and two hullers were commonly used in the process.

- **Huller**

SPINNING TOOLS:

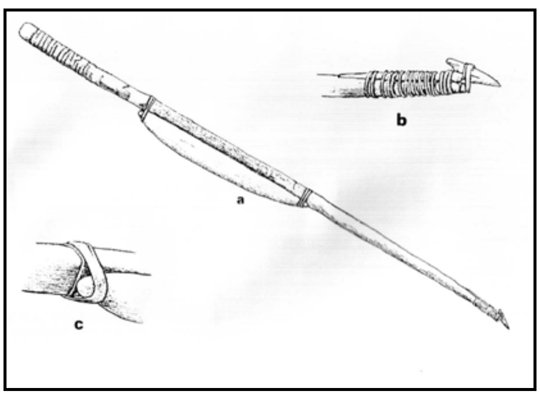
- **Fire Drill Hearth:** A stone with a small depression believe to have been used to start fires.
- **Spindle Whorl:** Round perforated disc generally believed to be used as a flywheel on a spindle for spinning fibers or on a pump drill for drilling holes.
- **Spindle Base:** These consist of small "netherstones" with a pitted or cupped depression in which a drill spindle rests. Generally they are differentiated from fire drill hearths by larger depressions and a smoother "friction-less" surface (Adams 2002:182). Conversely, they could have been used on top of a drill spindle when operated with a traditional bow drill in the drilling process. A careful examination of use-wear patterns is necessary to differentiate from "nutting stones".

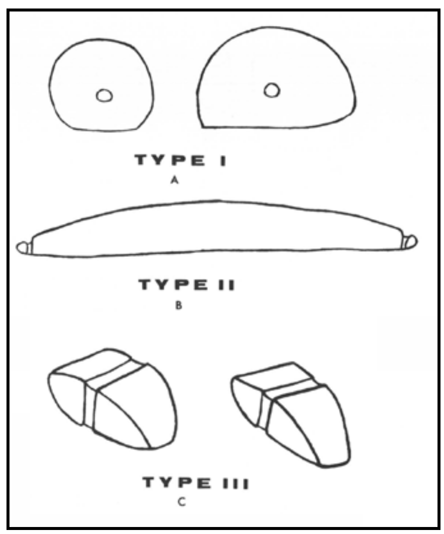
PERFORATING, CUTTING AND SCRAPING TOOLS:

- **Awl**: This is a stone tool with a projection shaped by grinding to a sharp point.
- **Reamer**: These tools are used to enlarge holes and generally are of expedient nature and have a cylindrical form or cylindrical projection. If they are formed by percussion flaking, they will be analyzed with flake tools and not groundstone.
- **Saw/File**: Have a long edge that is used to saw (serrated edge) or file (abrade) through material. These can be thin tabular pieces of sandstone. Sawing with stone is referred to as "slice cutting". Grooves created by slice cutting are typically distinguished from string cutting by the morphology of the groove. Stone saw marks are typically V shaped while string cutting creates a U shaped groove (Lu and Hang 2002).

PARAPHERNALIA:

- **Atlatl Parts:** This includes possible atlatl weights, bone or antler hook/spur, finger loops and charm stones. Atlatl weights are difficult to identify and in the past have often been described or identified as fishing weights, charm stones or pendants (Hester, et al. 1974:14). They may have suspension grooves (see below illustrations).





Examples of atlatl parts and weights from the Great Basin (after Hester, et al. 1974: Figures 3 and 7)

- **Stone Ball/Spherical Concretion:** Non-altered round stone.
- **Disk/Gaming Piece:** Small stone, shaped or not, believed to possibly have functioned as a gaming piece.
- **Plumb Bob/Plummet**: These artifacts are generally pecked into cylindrical shapes with associated grooves, notchings or perforations for suspension. They have been associated with Hohokam sites (Di Peso, et al. 1974).

- **Pipes and Tubes**: Pipes are tubes that were used to smoke tobacco. They are generally either cylindrical or conical "cloud blower" in shape.
- **Fetish/Figurine/Effigy**: Any ancient artwork representing a human, animal, anthropomorphic, or abstract design not intended to be worn, attached, or suspended from the body.
- **Pigment:** A material thought to have been collected for the purpose of coloration.
- **Natural Stones:** These materials are thought to have been collected for their unique shapes or other meaning. They can include crystals, concretions, fossils, meteorites, and other rocks and minerals.

ORNAMENTS AND INCISED STONES: Note that there is a supplementary form to describe any perforations present.

- **Flat Disk Bead**: The bead's width is shorter than the diameter.
- **Flat Figure-8 Bead**: Have a teardrop or bi-lobe shape.
- **Flat Oval Bead:** Has an oval perimeter.
- **Flat Rectangular/Square Bead:** Has a square or rectangular shape.
- **Cylindrical/Tube Bead:** The beads width is greater than the diameter.
- **Circular Barrel Bead:** The bead has a circular circumference but the sides are convex.
- **Other Bead**: specify in comments
- **Pendant:** Is an ornament that has been modified for suspension (i.e. perforation at top or groove to attach cordage).
- **Geometric:** A stone that has been modified to form a geometric (design with regular lines or shape).
- **Fetish/Figurine/Effigy**: Any ancient artwork representing a human, animal, anthropomorphic, or abstract design ***intended*** to be worn/attached or suspended from the body.
- **Indeterminate**: Used to enter an indeterminate type of ornament.
- **Incised Stone**: A stone that has had design elements incised. There is a supplementary form to describe the stone. Use oblique lighting if necessary to sketch design elements.
- **Other**: There are numerous other ornament types such as rings, plugs, toggles, buttons etc. Before you use this category please see Lab Supervisor as a new tool category may be designated.

CONTAINERS AND CONTAINER CLOSURES:

- **Bowl**: This is stone container with a hemispherical basin and the ability to rest securely on the ground.
- **Tray:** Usually wider than bowls with lower side and flatter base.
- **Censer:** Are distinguished from bowls by a cylindrical basin and having a design element.
- **Cap:** Cylindrical stone artifact modified to fit into a container's neck. They are distinguished from plugs by their wide top that rests on the neck of the container.
- **Plug/Stopper:** Have one end that is tapered to a point.
- **Lid/Cover**: Thin stone slab that rests on top of container

FRAGMENTARY/INDETERMINATE/OTHER GROUND STONE:

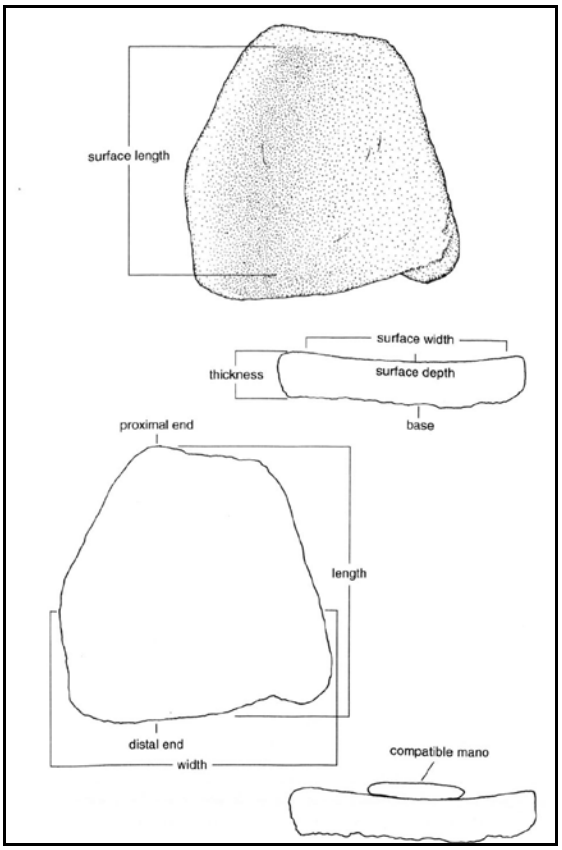
- Fragmentary Other
- Indeterminate - Other

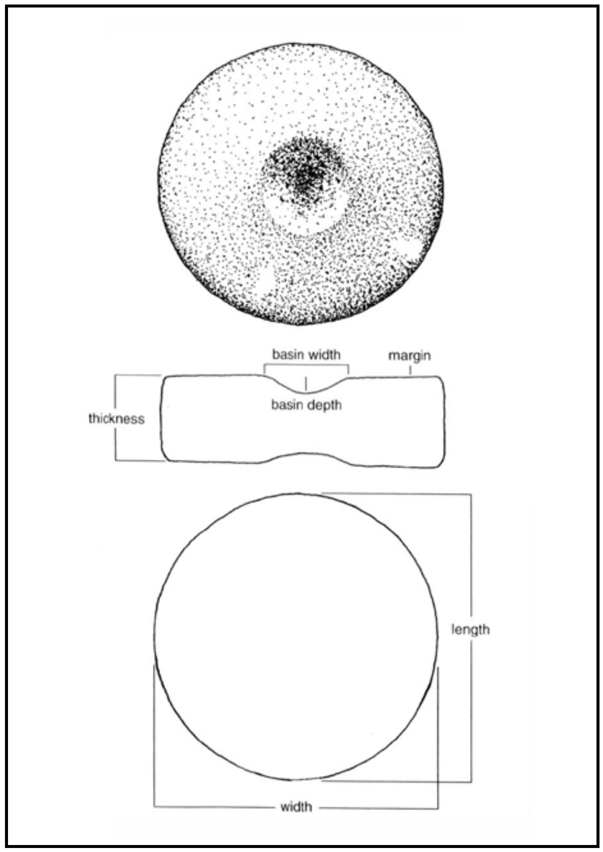
SECOND USE (SCN) uses the ARTYP to record the artifact's second use. ("-" if not applicable)

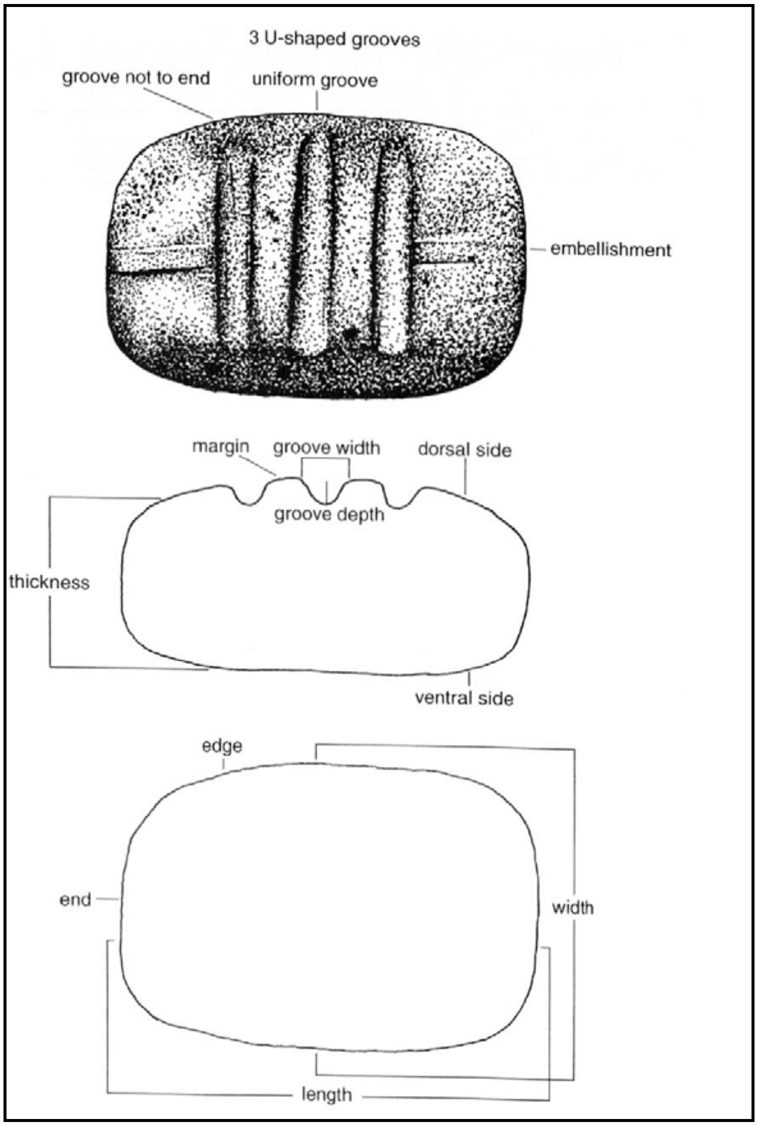
SEQUENCE (SEQ) refers to the sequence of secondary use. This is not applicable to those items used only for the activity for which they were designed. Sequential secondary use means the item was no longer usable in the activity for which it was originally designed. Concomitant secondary use means that the item was usable in both primary and secondary tasks (Adams 2002:234).

- **Sequential**
- **Concomitant**
- **Both (Sequential and Concomitant)**
- **Indeterminate/ or "-" for not applicable**

ARTIFACT MEASUREMENTS (L) (W) (T) (WT) Many of Adam's (2002) illustrations (see below) show the best places to take artifact measurements. Measurements should always be taken from the same locations on each artifact type, even if on a particular piece the greatest measurement is not the "length." Record dimensions to the nearest tenth (0.1) of a cm and the nearest tenth (0.1) of a gram.







Several examples of how to measure groundstone artifacts (after Adams 2002:Figures 4.4, 5.5, 5.19)

COMMENTS (CMT) additional notes about an artifact. Because coding forms are incapable of covering all possibilities, comments should be written about each artifact. Comments need not duplicate the data recorded on the forms, but can explain minor variations or expand on unusual attributes.

ACTIVE ELEMENT ADDENDUM FORM

This form records the details about all active elements, including handstones, manos, abraders, polishing stones, pestles, and any stone that is held in the hand during operation.

ACTIVE ELEMENT DATA

GRIPS/GROOVES (GR) keeps track of the nature and location of ***deliberately constructed*** finger grips, grooves, short grooves, handles, and other methods of holding artifacts. Grips are roughened areas and grooves can be either shallow or deep (Adams 2002:243). Adams uses the term "notch" to describe a short groove. We will not use that term as it conflicts with a term widely used in flaking terminology.

- **No grip or groove**
- **Grip-one edge**: deliberately roughened area on one edge only.
- **Grip-two edges**: deliberately roughened area on two edges.
- **Groove-one edge**: constructed groove on one edge.
- **Groove-two edges**: constructed groove on two edges.
- **Groove-encircling**: a groove that encircles the artifact
- **Ground and/or pecked to fit hand**: deliberately modified by pecking and/or grinding to fit hand.
- **Short groove only**: A short groove is present to facilitate holding.
- **Handle:** A handle has been constructed by any combination of flaking / pecking / grinding / polishing.
- **Flaked**: Item has been deliberately flaked to shape/hold, and doesn't fit the above categories. Also includes handstones that have been flaked/shaped to reduce mass.
- **Too worn**: The artifact is too worn to make a determination of deliberate modification for prehension.
- **Wear only:** There is no evidence for the construction of features to assist prehension.
- **Indeterminate/ or "-" for not applicable**.

SURFACE TEXTURE (STEXT) records the nature of the use surface. A coarse grained material can be worn smooth and then resharpened by pecking to restore the roughness of the stone. This attribute helps the analyst decide the nature of the contact surface and assess the use of wear-management strategies. Please select the used area of the tool that occupies the largest area and note additional areas in comments.

- **Rough**: When you run your finger across the surface, surface texture is obvious.
- **Smooth**: When you run your finger across the surface, no obvious surface texture is felt.
- **Polished:** When you run your finger across the surface, no obvious surface texture is felt and the surface appears to be polished from use. Often polished surfaces will have a distinct sheen due to reflective properties.
- **Differential/Deliberate Re-sharpening**: The surface displays definitive evidence of secondary pecking to re-establish a rough surface.
- **Indeterminate/ or "-" for not applicable**

WEAR LEVEL (WRLV) is an assessment combining both macroscopic and microscopic observations. Like surface texture, this attribute helps the analysts evaluate the nature of the contact surface. The Chapter 2 discussion in Adams (2002) of use-wear analysis explains why these are important attributes to observe. Adams professes to be able to make these observations macroscopically, but in practice in material sciences one needs to use sophisticated means of observation. Wear patterns are influenced by a great many factors including type of contact material(s), amounts of force applied and raw material types. Here we are after a general observation of the nature and distribution of the used surface.

- **Highs only**: Rough feeling when you drag your fingernail across the surface.
- **Highs and lows**: Combination of rough feeling and smooth feeling. A surface that exhibits both fatigue and abrasive wear. Some of the smooth areas may exhibit striations/scratches. A mano or metate surface like this can be created by "re-sharpening".
- **Smooth spots**: Some areas do not catch your fingernail, but this is patchy across the use surface.
- **Smooth all over**: Your fingernail glides across the use-surface. Striations are likely to be evident depending on the contact material(s).
- **Unused**: The surface may or may not appear rough. However, there is no contrast between the used surface and other areas of the stone suggesting that the surface was produced by natural processes.
- **Other** (explain in comments)
- **Indeterminate/ or "-" for not applicable**

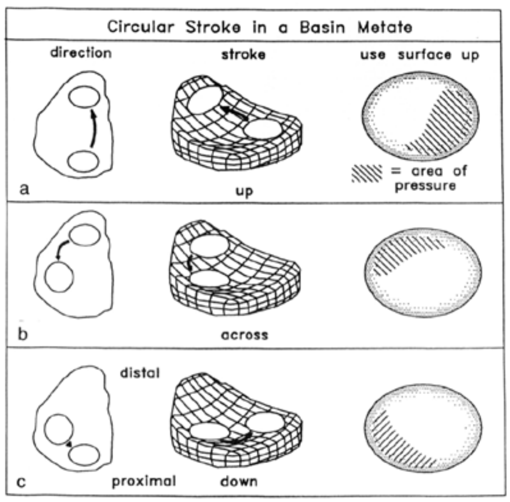
WEAR TYPE (WRTP) is another assessment that relies on both macroscopic and microscopic observations. It records the nature of the damage from the mechanisms described in Chapter 2 of Adams (2002). Here we are making our observations macroscopically with the aid of hand lens and low power stereomicroscopy. The surface of the artifact should be viewed with oblique fiber optic lighting. If more than one wear type is observed, enter the most prevalent in **WRTP1**, and the other(s) in **WRTP2** and **WRTP3** (if applicable).

WRTP 1.__________________WRTP 2._________________ WRTP 3.__________________

- **Manufacture only:** All attrition and/or polish on the artifact is believed to have been caused by the process of manufacture and not use.
- **Abrasion:** Human caused abrasion is typically identified macroscopically by "scratches" or striations and flattened surface grains. These features are not uniformly distributed across all faces of an artifact.
- **Abrasion and impact fractures:** Impact fractures are generally formed by strikes from a hammerstone. A small surface area is "pulverized" resulting in a visible scar on the surface.
- **Abrasion, impact fractures and flaking**
- **Abrasion and rounding:** An artifact that displays both an area of abrasion and a macroscopically distinct rounded edge, believed to be caused from use.
- **Flaking and sheen/polish**: The edge/surface displays use-related flake attrition and creation of a polish believed to be from material contact.
- **Impact fractures:** The surface of the artifact displays distinct impact fractures believed to be from use and not manufacturing.
- **Impact fractures and use-polish**: The artifact displays distinct impact fractures and a sheen both believed to be from use and not manufacture.
- **Impact fractures and rounding:** The artifact displays distinct impact fractures and edge rounding both believed to be caused from use and not manufacture.
- **Only edge rounding**: The artifact displays only edge rounding from use.
- **Rounding and sheen:** The artifact displays edge rounding and polish on the edge believed to be from use contact.
- **Polish:** The only use-wear appears to be a distinct polish/sheen.
- **Striations:** The only use-wear present are scratch "striations" believed to be caused by use.
- **Indeterminate/ or "-" for not applicable**

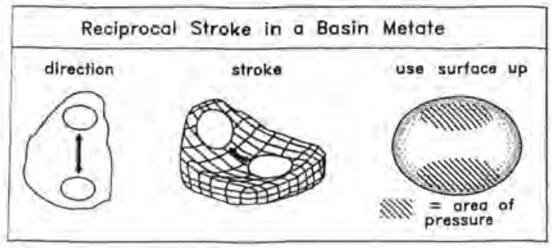
MOTOR HABITS FOR ACTIVE ELEMENTS OF MILLING EQUIPMENT (STRK) records the type of motor habits used with artifact. Reciprocal strokes move the tool in back-and-forth motions. Circular strokes move the tool in rotational motions around a surface. Flat strokes maintain the tool in full contact with the opposing surface at all times. Rocking strokes lift either the proximal or distal edge away from the opposing surface at some point in the motion. Crushing motions use pressure and the weight of the stone. Adams (2002:246) suggests "pecking strokes" are at more of an angle than crushing or pounding strokes. However, in material science studies pecking usually refers to striking a surface with a "beak" or projection. In flintknapping this refers to striking the surface at a near 90 degree angle to crush or pulverize areas of the surface. As active elements of milling equipment typically display rounded edges, they are generally not suitable for "pecking" motions. Use-wear (primarily rounding/abrasion and linear features) is formed on the handstone depending on the type of motion used in a basin metate.

- **Circular-flat**: Base of the handstone will be flat with randomly appearing oriented linear features.
- **Circular-rocking**: These manos when worked in a basin metate (see below illustration) will have "wear facets on parts of their ends and edges, and multidirectional [random appearing] striations on their surfaces" (Adams 2002:Figure 5.2).



Wear patterns expected with a right handed grinder using a counter clockwise movement in a basin metate. The pressure is under the thumb during the away stroke and under the fingers at the return stroke. Where facets will develop as shown in the illustration (after Adams 2002:Figure 5.2).

- **Reciprocal-flat:** Base of the handstone will be flat with linear features arranged in a distinctly linear pattern that is oriented parallel to the movement of the handstone.
- **Reciprocal-rocking:** These manos will have wear facets only on their edges (see below illustration). Linear features will be arranged in a distinctly linear pattern.
- **Trough**: Trough manos move only in a reciprocal manner. They can be identified by distinct wear on the ends from rubbing against the trough walls (see below)
- **Multiple/Combination** (explain in comments)
- **Other**
- **Indeterminate/ or "-" for not applicable**



Wear patterns expected from a reciprocal stroke in a basin metate. A wear facet forms under the palm on the away movement and under the fingers on the return. The force is less on the return (after Adams 2002:Figure 5.3).

COMPATIBLE (COMPAT) catalog number of any compatible artifact.

COMMENTS: Additional comments to those made in the General Ground Stone form.

PASSIVE ELEMENT ADDENDUM FORM

This form records the details about all passive elements, including netherstones, metates and mortars, hullers, and lithic anvils which comprise the bottom stones upon which both non-food and food substances or items are altered.

PASSIVE ELEMENT DATA

SURFACE COVERAGE (SCOV) records the extent and nature of the surface. In some cases, this helps the analyst recognize the size and configuration of the handstone or other artifact used with the netherstone/grinding slab.

- **Border-flat**: The elevation of the perimeter of the netherstone is more or less the same as the interior.
- **Border-raised:** The elevation of the perimeter of the netherstone is clearly raised as a result of use-wear focused on the interior of the tool.
- **Indeterminate/ or "-" for not applicable**

SURFACE TEXTURE (STEXT) records the nature of the use surface. A coarse grain material can be worn smooth and then resharpened by pecking to restore the roughness of the stone. This attribute helps the analyst decide the nature of the contact surface and assess the use of wear-management strategies. Please select the used area of the tool that occupies the largest area and note additional areas in comments.

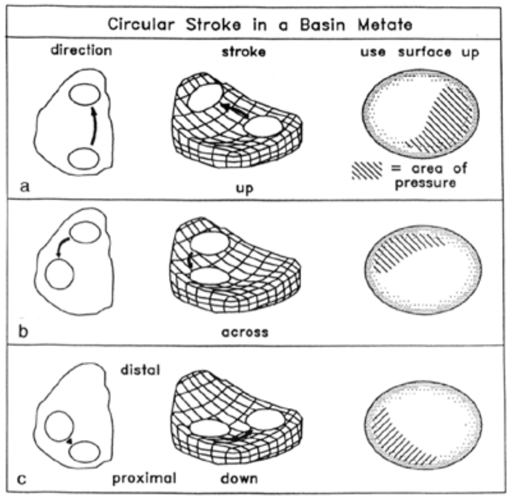
- **Rough**: When you run your finger across the surface, surface texture is obvious.
- **Smooth**: When you run your finger across the surface, no obvious surface texture is felt.
- **Polished:** When you run your finger across the surface, no obvious surface texture is felt and the surface appears to be polished from use. Often polished surfaces will have a distinct sheen due to reflective properties.
- **Differential/Deliberate Re-sharpening**: The surface displays definitive evidence of secondary pecking to re-establish a rough surface.
- **Indeterminate/ or "-" for not applicable**

SURFACE MANUFACTURE (SMAN) records the nature of visible damage created by the manufacturing techniques used to shape ***the surface***.

- **Natural**
- **Ground to shape**
- **Pecked to shape**
- **Pecked and ground to shape**
- **Worn and pecked to shape**
- **Worn and ground to shape**
- **Combination**
- **Use-wear has obliterated all manufacture evidence**
- **Indeterminate/ or "-" for not applicable**

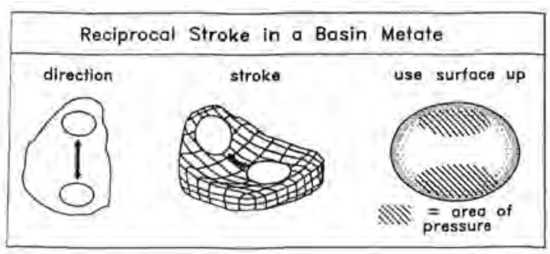
MOTOR HABITS FOR PASSIVE ELEMENTS OF MILLING EQUIPMENT (STRK) records the general nature of the motor habit used with the netherstone or metate. Reciprocal strokes would have moved across the surface in a back-and-forth motion. Circular strokes would have moved around the stone (Adams 2002:249).

- **Circular movement on flat design**: If extensively worn flat/concave metates can develop a depression. There will be no distinct borders demarking the utilized surface. Circular striations will be present on the surface.
- **Circular movement on basin design**: Circular striations will be present on the surface of the netherstone.
- **Reciprocal-rocking motion**: Linear striations parallel to the length of the basin will indicate the reciprocal motion (Adams 2002:Figure 5.2). Distinct lateral margins may be present.



Wear patterns expected with a right hand grinder using a counter clockwise movement in a basin metate. The pressure is under the thumb during the away stroke and under the fingers at the return stroke. Where facets will develop as shown in the illustration (after Adams 2002:Figure 5.2).

- **Reciprocal-flat:** Striations will be arranged parallel with length of the netherstone and parallel to the movement of the handstone. Distinct lateral margins may be present.



Wear patterns expected from a reciprocal stroke in a basin metate. A wear facet forms under the palm on the away movement and under the fingers on the return. The force is less on the return (after Adams 2002:Figure 5.3).

- **Trough**: A distinct constructed trough will be present. Trough edges may show evidence for re-widening. Linear features will be parallel to the edges of the trough. (see photo below artifact type 21).
- **Multiple/combination** (explain in comments)
- **Other**
- **Indeterminate/ or "-" for not applicable**

COMPATIBLE (COMPAT) catalog number of any compatible artifact.

USE SURFACE LENGTH (SL), WIDTH (SW), AND DEPTH (SD) record the dimensions of the use surface.

RECORD THE AVERAGE BORDER/MARGIN WIDTH IF APPLICABLE

COMMENTS: Additional comments to those made in the General Ground Stone form.

GROOVED ARTIFACTS ADDENDUM FORM

This form records the details about all grooved artifacts

GROOVED ARTIFACT DATA

EMBELLISHMENT (EMB) records the nature of any embellishment. Embellishments include incised lines, raised ridges (relief), and decorative grooves. These can occur singly or in multiples, and can be mixed such that incised lines and raised ridges both occur on one tool (Adams 2002:261). If the embellishment forms a design element, describe the element in comments and flag for photography.

- **Incised line**
- **Incised lines perpendicular to grooves**
- **One ridge perpendicular to grooves**
- **Multiple ridges perpendicular to grooves**
- **Multiple ridges and incised lines perpendicular to grooves**
- **Other (explain in comments)**
- **None**

GROOVE CONFIGURATION (GRVCF) records whether the groove is uniform across its length or if there is more wear toward the end.

- **Groove has uniform depth across its length**
- **There is more wear towards the end of the groove.**
- **Indeterminate/ or "-" for not applicable**

GROOVE ORIENTATION (GRVO)

- **Length**: groove is oriented along the length
- **Widthwise**: groove is oriented along the width
- **Diagonal**: oriented diagonally across the stone
- **Indeterminate/ or "-" for not applicable**

GROOVE DIMENSIONS groove dimensions should be taken at their maximum.

GROOVE LENGTH (GRL)

GROOVE WIDTH (GRW)

GROOVE DEPTH (GRDP)

COMMENTS: Additional comments to those made in the General Ground Stone form.

PERFORATED ARTIFACT FORM

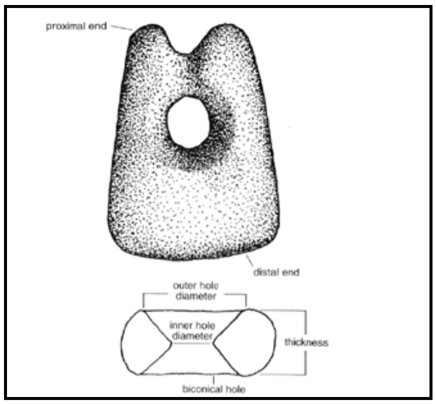
This form records the details about all perforated artifacts.

PERFORATED ARTIFACT DATA

MINIMUM HOLE DIAMETER (IHD)

MAXIMUM HOLE DIAMETER (OHD)

Please note that measurements should be taken at their maximum.



How to record the inner and outer dimension of a hole (after Adams 2002:Figure 5.23).

HOLE TYPE (HTYP) records the hole configuration. Biconical means the outside hole diameters on both ends of the hole are larger than the inside hole diameter. Conical means that one outside hole diameter is larger than the inside and the other outside diameters. Cylindrical holes have the same diameter throughout the hole.

- **Biconical stone drilling**: The hole was made by bifacial drilling. The walls of the hole slope inwards. This type of hole is typical of bifacial stone drilling.
- **Conical stone drilling**: The hole was drilled unifacially and slopes inward. These type holes are indicative of stone drilling.
- **Straight wall**: This type hole has straight walls and is indicative of “tube drilling” with bamboo, river cane or similar.
- **Perforation by Pecking**: These type holes generally have irregular walls and may have remnant pecking scars around the perimeter.
- **Natural**: The hole appears to have been formed by natural processes.
- **Not Applicable**

HOLE COMPLETENESS (HOLCP): Record the nature of the hole.

- **Complete**: The hole was obviously completed and is intact.
- **Incomplete**: The hole was started but not completed.

COMMENTS: Additional comments to those made in the General Ground Stone form.

INCISED STONE FORM

This form records the details concerning incised stones.

INCISED STONE DATA

The goal of this supplemental form is to obtain a verbal description of the artifact's design as well as a 1:1 line drawing and photograph. For correct terminology to describe the design elements please refer to Trudy Thomas' (1983) chapter in "The Archaeology of Monitor Valley 2. Gatecliff Shelter" and Ottenhoff's (2015) Chapter 8 in "Incised Stones of the Great Basin: A Contextual Archaeology".

NUMBER OF DESIGN ELEMENTS PRESENT? Please enter the number of design elements present.

HOW MANY FACES OF THE STONE ARE INCISED? Please enter the number of faces on the stone that are incised.

VERBAL DESCRIPTION: Using terminology of the above publications, describe the incised design(s) elements present.

UPLOAD ILLUSTRATION AND PHOTOGRAPH

REFERENCES

Adams, Jenny L.

1988 Use-Wear Analyses on Manos and Hide-Processing Stones. Journal of Field Archaeology 15(3):307-315.

1989 Methods for Improving Ground Stone Artifacts Analysis: Experiments in Mano Wear Patterns. In *Experiments in Lithic Technology*. D.S. Amick and R.P. Mauldin, eds. Pp. 259-276. Oxford: BAR International Series.

1997 Manual for a Technological Approach to Ground Stone Analysis. Tuscon: Center for Desert Archaeology.

2002 Ground Stone Analysis, A Technological Approach. Salt Lake City: University of Utah Press.

Di Peso, C.C., J.B. Rinaldo, and G.J. Fenner

1974 Casas Grandes: A Fallen Trading Center of the Gran Chichimeca, Vol 7, Stone and Metal. Flagstaff: Northland Press.

Elston, Robert G.

1979 The Archeology of U.S. 395 Right-of-Way Between Stead, Nevada and Hallelujah Junction, California. Report to Nevada Highway Department and CALTRANS, Sacramento. Report on file, Nevada Archaeological Survey, University of Nevada, Reno.

Hester, Thomas R., Michael P. Mildner, and Lee Spencer

1974 Great Basin Atlatl Studies. Ramona: Ballena Press.

Kolvet, Renée Corona, and Judy A. Eisele

2001 A Ground Stone Study and Classification System for the Great Basin. Salinas: Coyote Press.

Liu, Li, Judith Field, Richard Fullagar, Sheahan Bestel, Xingcan Chen, and Xiaolin Ma

2010a What did grinding stones grind? New light on Early Neolithic subsistence economy in the Middle Yellow River Valley, China. Antiquity 84:816-833.

Liu, Li, Judith Field, Richard Fullagar, Chaohong Zhao, Xingcan Chen, and Jincheng Yu

2010b A functional analysis of grinding stones from an early holocene site at Donghulin, North China. Journal of Archaeological Science 37(10):2630-2639.

Lu, Jianfang, and Tao Hang

2002 Prehistoric Jade Working Based on Remains at the Site of Dingshadi. In Enduring Art of Jade Age China. Chinese Jades of Late Neolithic through Han Periods. E. Childs-Johnson, ed. Pp. 31-42. New York: Throckmorton.

Olsen, William H., and Louis A. Payen

1983 Excavations at CA-MER-130: A Late Prehistoric Site in Pacheco Pass. In Papers on Merced County Prehistory, California Archaeological Reports No. 21. Pp. 1-85. Sacramento: State of California, The Resources Agency, Department of Parks and Recreation.

Ottenhoff, Randy

2015 Incised Stones of the Great Basin: A Contextual Archaeology, Anthropology, Doctoral Dissertation, University of Central Lancashire.

Thomas, Trudy

1983 Chapter 11. Material Culture of Gatecliff Shelter: Incised Stones. In The Archaeology of Monitor Valley 2. Gatecliff Shelter, edited by D. H. Thomas, pp. 246-278. The American Museum of Natural History, New York.