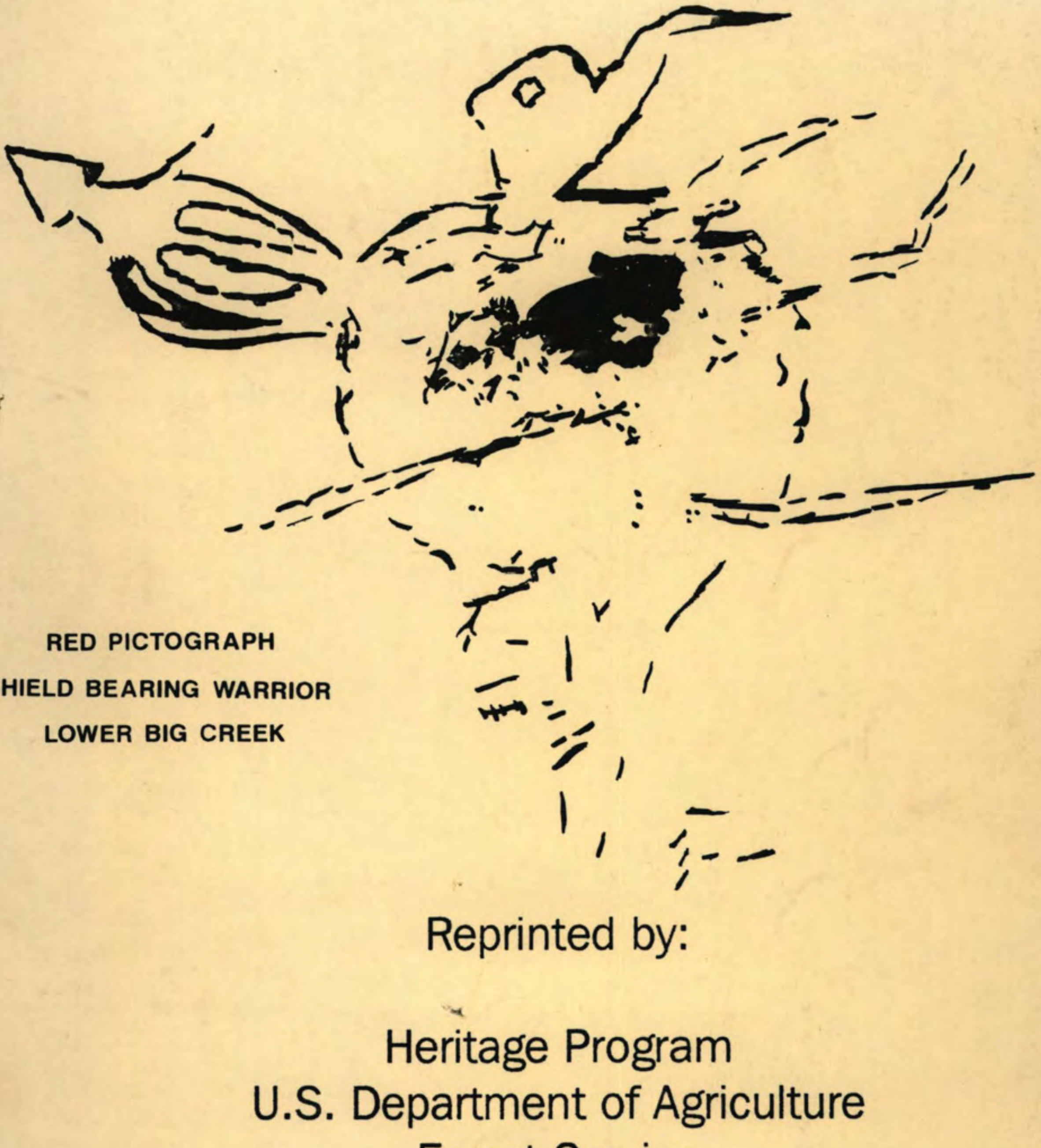
ARCHAEOLOGICAL INVESTIGATIONS AT WATERFALL VILLAGE AND BIG CREEK CAVE



RED PICTOGRAPH
SHIELD BEARING WARRIOR
LOWER BIG CREEK

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Intermountain Region
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TEST EXCAVATIONS IN THE RIVER OF NO RETURN WIDERNESS:

PRELIMINARY REPORT ON WATERFALL VILLAGE AND BIG CREEK CAVE

Jerry Wylie, Tom Scott, Joe Gallagher

USDA FOREST SERVICE
INTERMOUNTAIN REGION
October 1, 1981
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Test Excavations in the River of No Return Wilderness: Preliminary Report on Waterfall Village and Big Creek Cave

Introduction

On September 1-9, 1981, a team of eight Forest Service and volunteer archeologists conducted limited test excavations at two prehistoric sites along the Middle Fork of the Salmon River, Idaho. One was a small dry cave, PY-147 (10VY67), at the mouth of Big Creek, Payette National Forest; the other was an open "pithouse village", SL-267, on Waterfall Creek, Salmon National Forest. The two sites are about 1/4 mile apart (Fig. 1). These were the first excavations ever carried out within the River of No Return Wilderness (previously Idaho Primitive Area). They supplement an extensive Forest Service sponsored inventory program in this area started in 1978 by Ruthann Knudson and others.

Work at the cave site was directed by Jerry Wylie and Tom Scott, and the village excavation was directed by Joe Gallagher. Field personnel included Tom Green, Virginia Harris, Jan Peterson, Jan Smith, and Amy Gilreath. Six people and all equipment/supplies were loaded on two planes and flown directly from Boise to the Flying B Ranch on the Middle Fork by a charter air service. From there the excavation equipment and camping gear was packed by 10 horses 15 miles downstream to Waterfall Creek. Personnel were flown from the Flying B to Soldier Bar, where they backpacked 6 miles down Big Creek to camp. On the return, the entire process was reversed. Two additional crew members were flown into Soldier Bar mid way through the week.

The following presents a very brief description of the work conducted and some of the preliminary results. At present we have not analysed any of the artifacts or received the C14 or pollen results.

Objectives

1) Provide information for use in developing the wilderness management plan.
2) Describe and map all surface information.
3) Determine the sites' research potential: depth, data categories present, preservation, chronology, cultural sequence.
4) Generate testable hypotheses for future research.
5) Explore the logistical problems of conducting fieldwork in this kind of remote wilderness setting.

Site Descriptions and Testing Methods

Big Creek cave is situated on a north-facing canyon face about 20 meters above the confluence of Big Creek and the Middle Fork Salmon River. The cave itself is 6 meters wide by 12 meters deep, with a maximum height of 2 meters. Although there was only one small looter's pit in the cave floor when we arrived, apparently much of the northeast side of the cave had been disturbed in the past. After making a contour map, we excavated a series of four 1 x 1 meter test pits in arbitrary 10 cm. levels. The end result was a 1 x 4 meter trench a little more than a meter deep at its deepest point. All materials were screened through a 1/4" mesh. In addition to pollen samples, a total of 9 charcoal specimens were collected for C14 dating.

The Waterfall Village site is a series of more than a dozen shallow depressions and lithic debris along a small ponderosa-covered stream terrace. Waterfall Creek at this point is approximately 320 feet above the Middle Fork Salmon River. Similar sites are said to extend up the creek for at least 6 miles, but time prevented us from visiting these.

We excavated most of one quadrant of a suspected pithouse depression using six 1 x 1 meter test pits. Excavation was by 10 cm. arbitrary levels and all materials were screened through 1/4" mesh. An adjacent horse corral area previously disturbed by hunters was also shovel scraped to expose any features present. A measured site map was prepared using the Reddi Mapper system used so successfully during the 1978 Middle Fork campground survey. One C14 sample was obtained from the house feature.

Results

The cave yielded approximately 50 diagnostic projectile points, four scrapers, a drill, and two knife blades, one with the remains of hafting mastic on the base. Also present were large quantities of freshwater mussel shell and large ungulate bones (elk/deer?) at all levels and 10 large fish vertebra, probably salmon or steelhead. Of special interest were finds of plain brown/grey pottery and shell/bone beads, including two specimens of what may be Olivella shell beads from the Pacific coast. Typologically, the assemblage appears to be more Great Basin than Plateau. The deposits were dry throughout and surprisingly free from rodent burrowing. Extensive ash and charcoal lenses were common throughout the upper levels.

Work at the village site exposed a dual component house feature. The upper levels contained desert side-notched/small trangular Late Prehistoric projectile points while the house fill itself contained Middle to Late Archaic materials. Preservation was good and faunal remains were abundant. No ceramics were found. Diagnostic tools included 13 projectile points, three scrapers, and three drills. Lithic sources represented in the sample were very diverse, with a possible tendency to emphasize obsidian/ignimbrite in the upper occupation and cherts/quartzites in the lower units. The structure itself was over one meter deep and approximately 7-8 meters in diameter. However, the outer perimeter of the house was poorly defined and, because of a lack of time, the actual occupation floor was not reached.

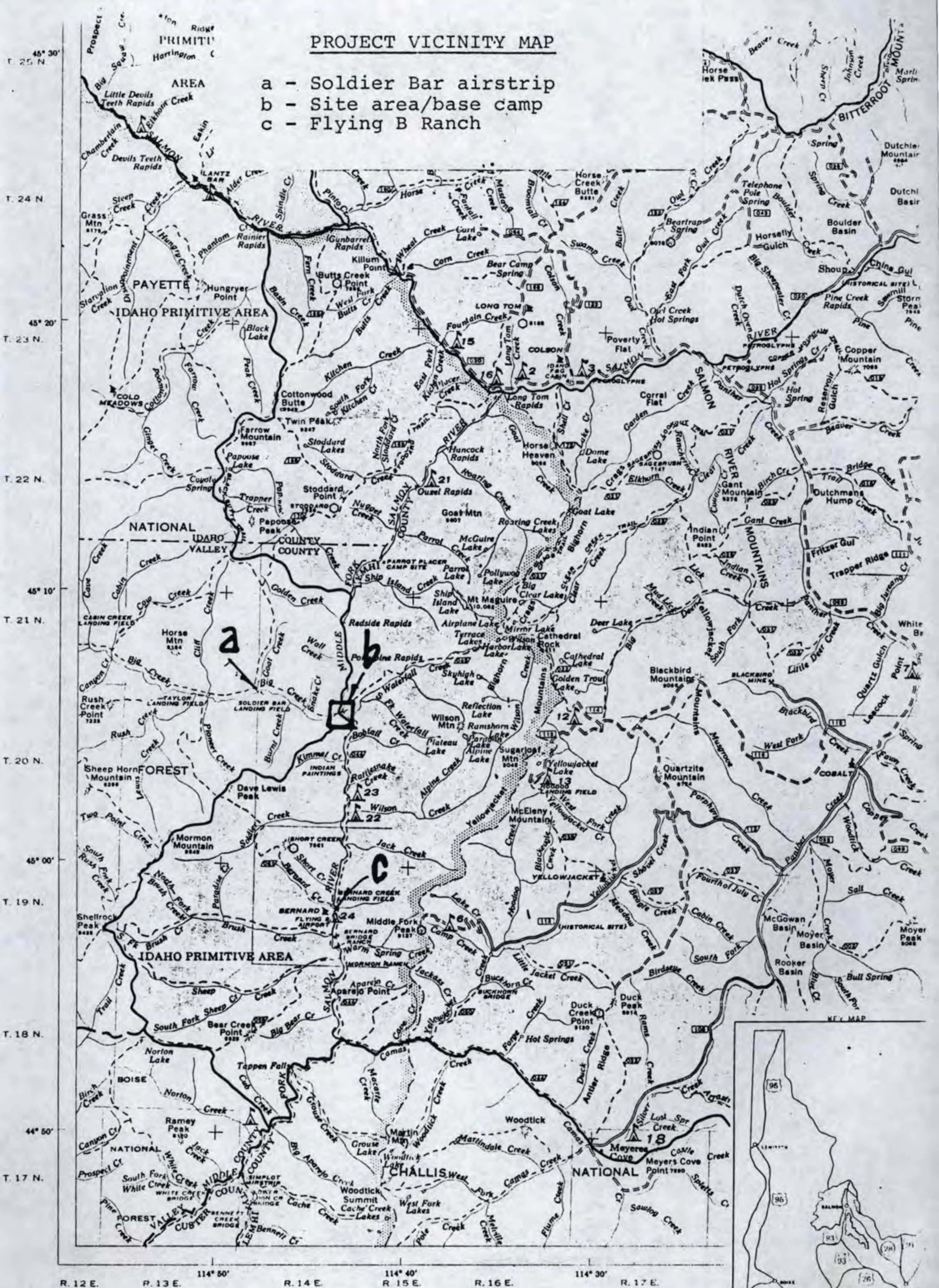


Fig. 1. Project location.

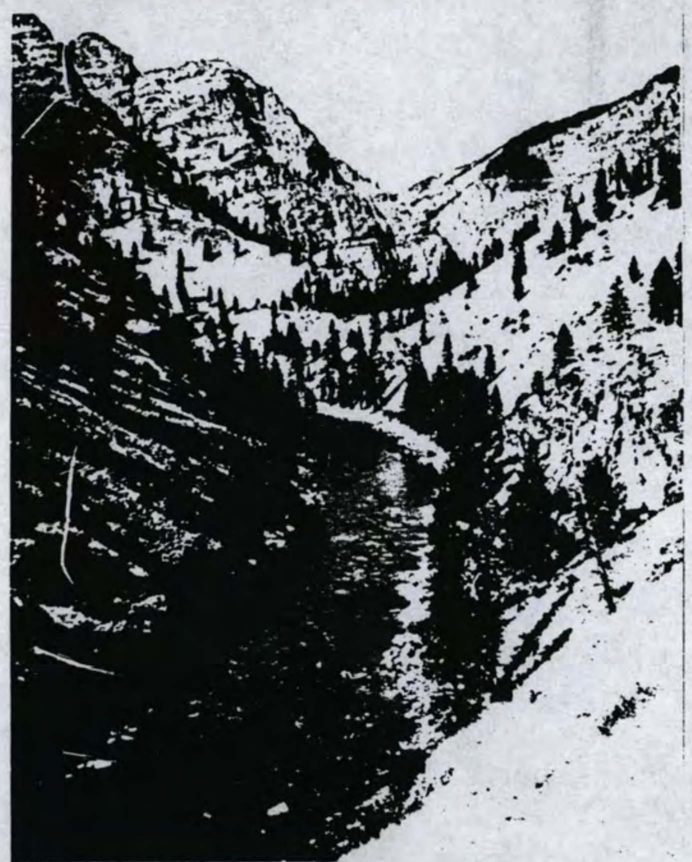


Fig. 2. Middle Fork Salmon River near the project area.

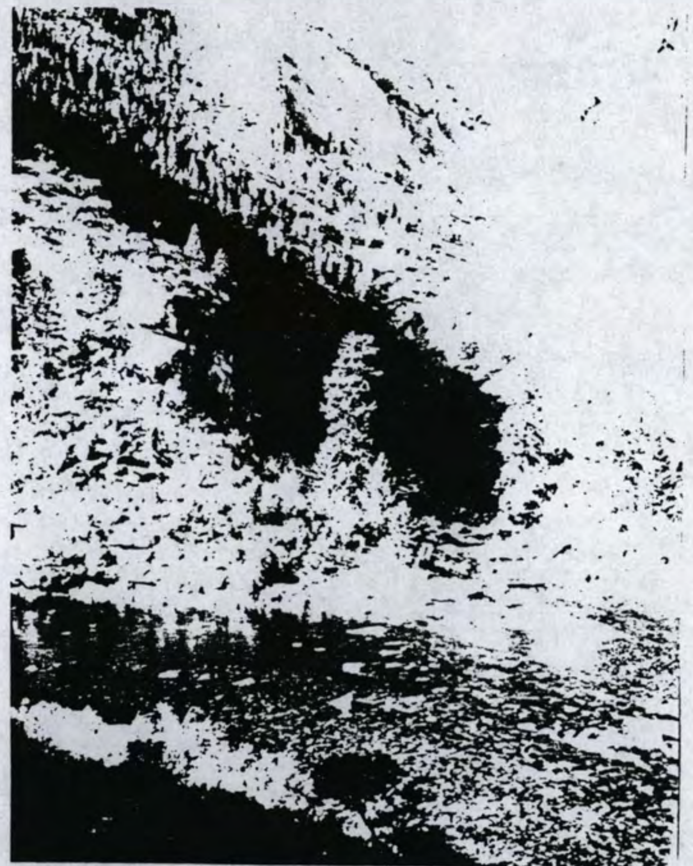


Fig. 3. Confluence of Big Creek and Middle Fork Salmon River. Big Creek cave in center of photograph.

Fig. 4. Mouth of Big Creek Cave.

Fig. 5. Interior of Big Creek Cave; view towards mouth.

Fig. 6. Big Creek Cave, PY-147, site maps/profiles.

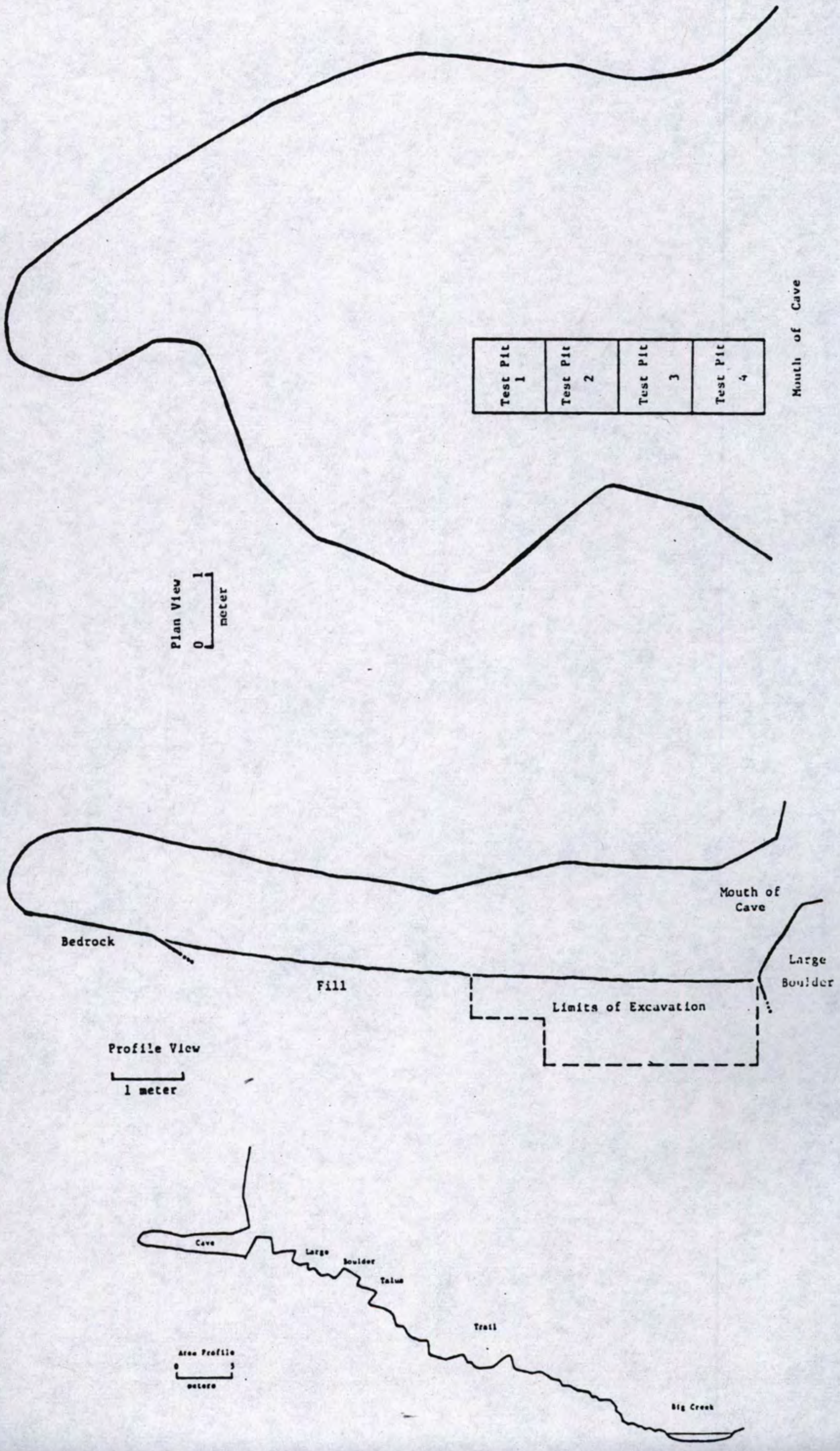
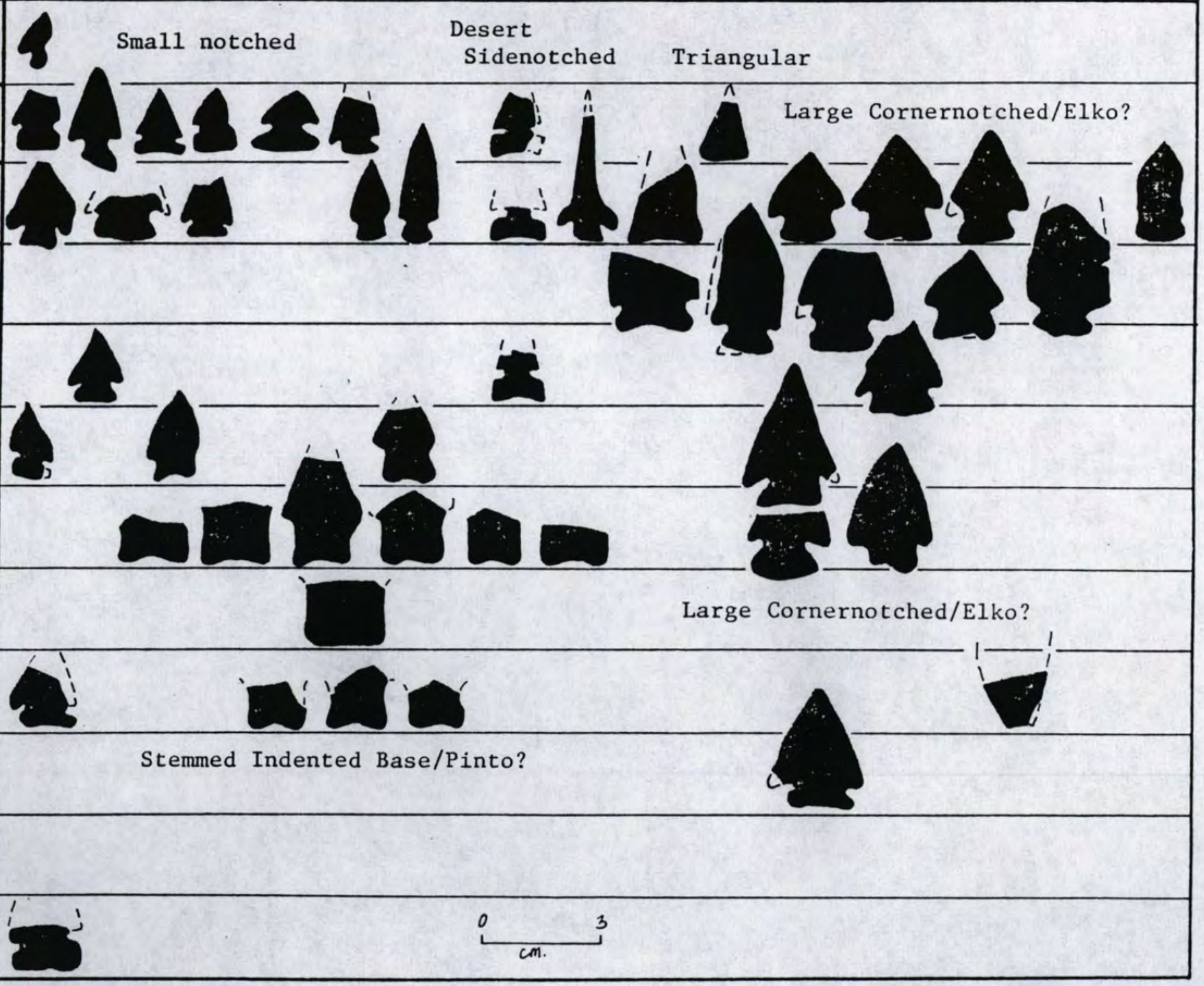


Fig. 7. Big Creek Cave trench profile of test pits 2, 3, and 4.

Fig. 8. Selected artifacts from Big Creek Cave, PY-147.

LEVELS \ ARTIFACT TYPES	Pottery Sherds	Radio-Carbon Dates (B.P.)	PROJECTILE POINTS
Surface	2		
0-10 cm.	6	580 ± 70 1050 ± 80	
10-20 cm.	3	1100 ± 60 1230 ± 70	
20-30 cm.		2010 ± 60	
30-40 cm.			
40-50 cm.			
50-60 cm.		3290 ± 120	
60-70 cm.		3220 ± 80	
70-80 cm.			
80-90 cm.		3900 ± 90 2600 ± 330	
90-100 cm.			
100-110 cm.			



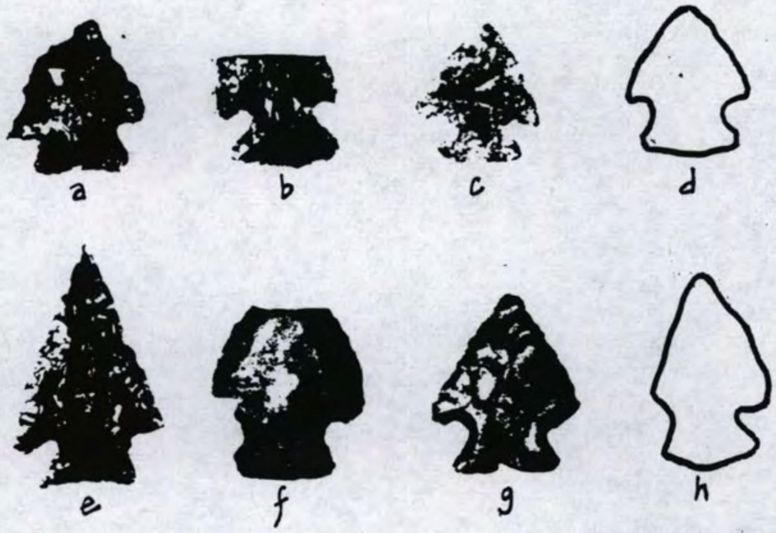


Fig. 9. Large corner-notched points from Big Creek Cave. Length of specimen e 3.8 cm.

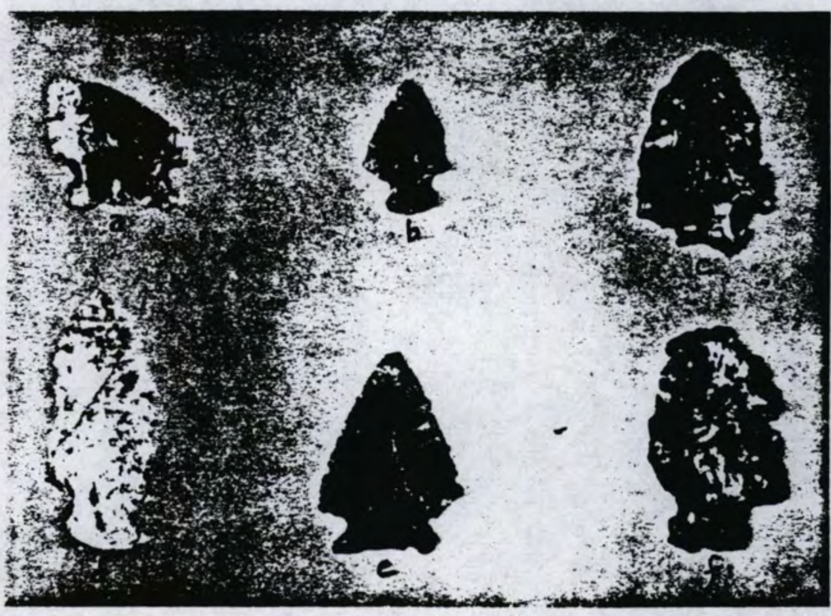


Fig. 10. Large corner-notched points from Big Creek Cave. Length of d 3.9 cm.

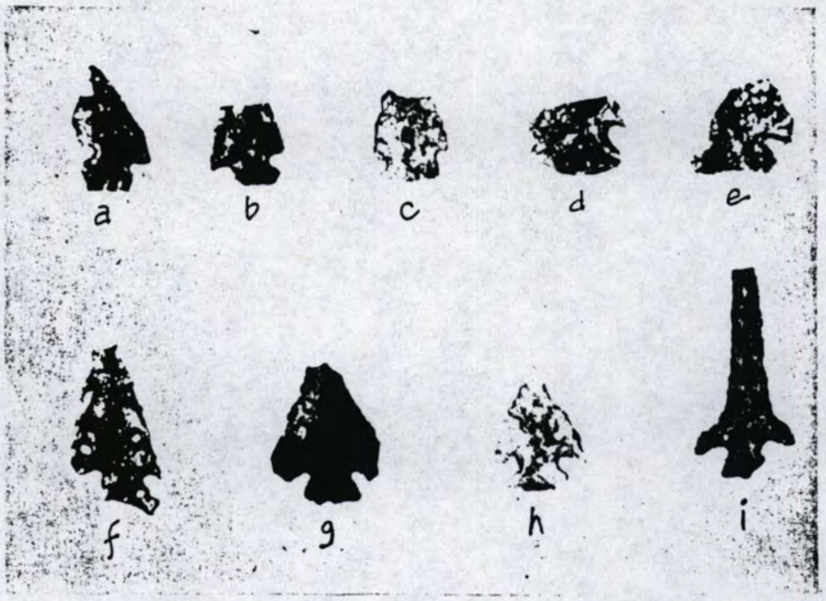


Fig. 11. Small corner-notched points from Big Creek Cave. Length of specimen f 2.7 cm.

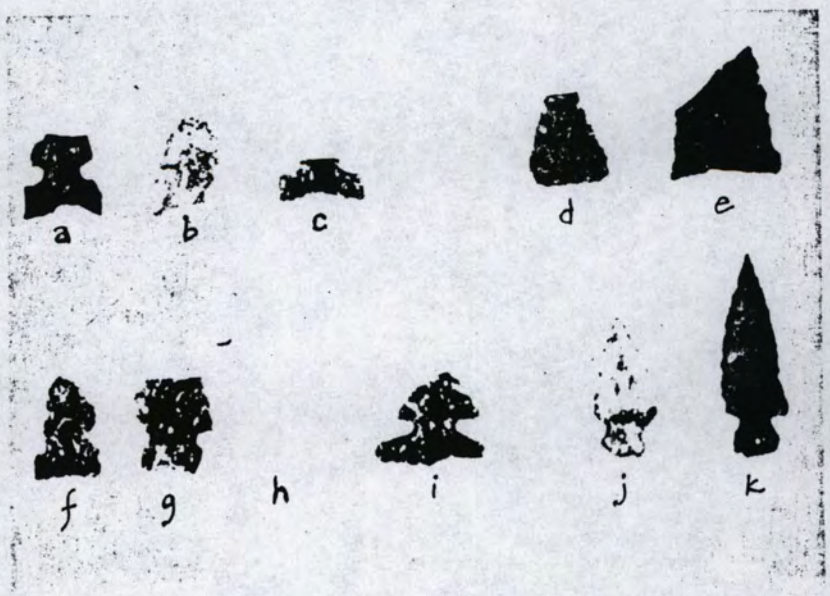


Fig. 12. Miscellaneous small points from Big Creek Cave. Length of specimen k 3.1 cm.

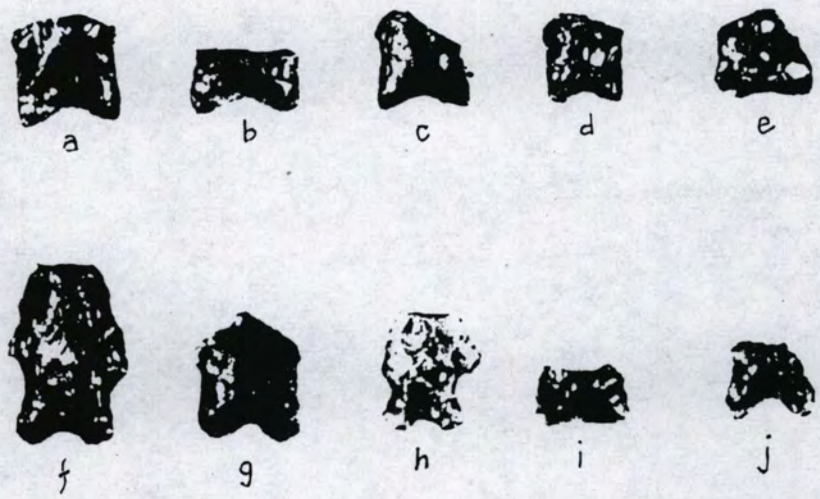


Fig. 13. Stemmed Indented Base points from Big Creek Cave. Length of specimen f 2.7 cm.

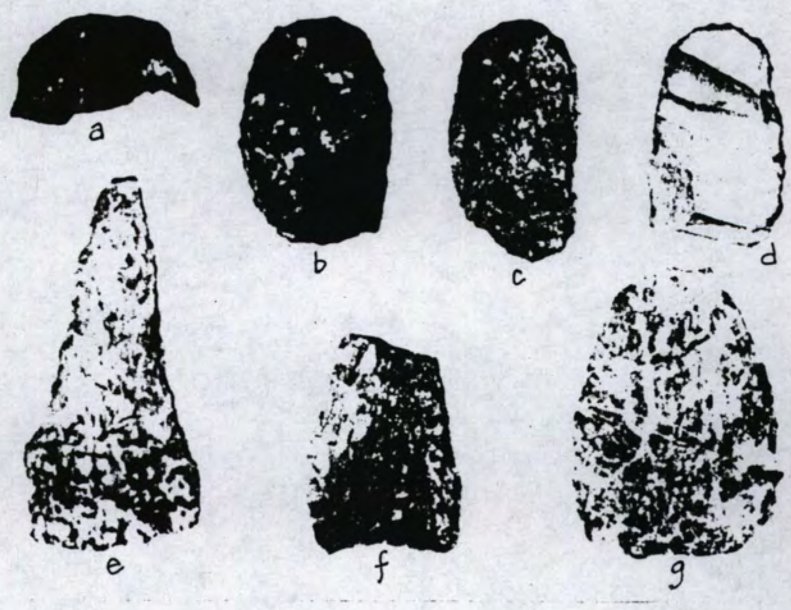


Fig. 14. Scrapers and knives from Big Creek Cave. Length of specimen e 5.7 cm. (note mastic).

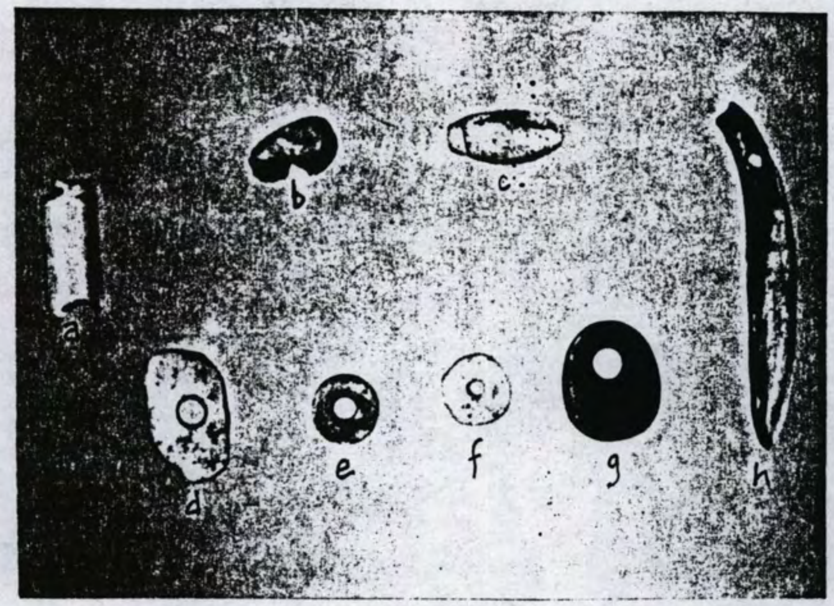


Fig. 15. Shell and bone beads/pendants from Big Creek Cave. Length of specimen g 1.3 cm.

Fig. 16. Blow-up of Olivella shell bead from Big Creek Cave. Actual length 1.3 cm.

Fig. 17. Waterfall Village site, SL-267.
View east up Waterfall Creek.

Fig. 18. Test excavations at Waterfall Village.

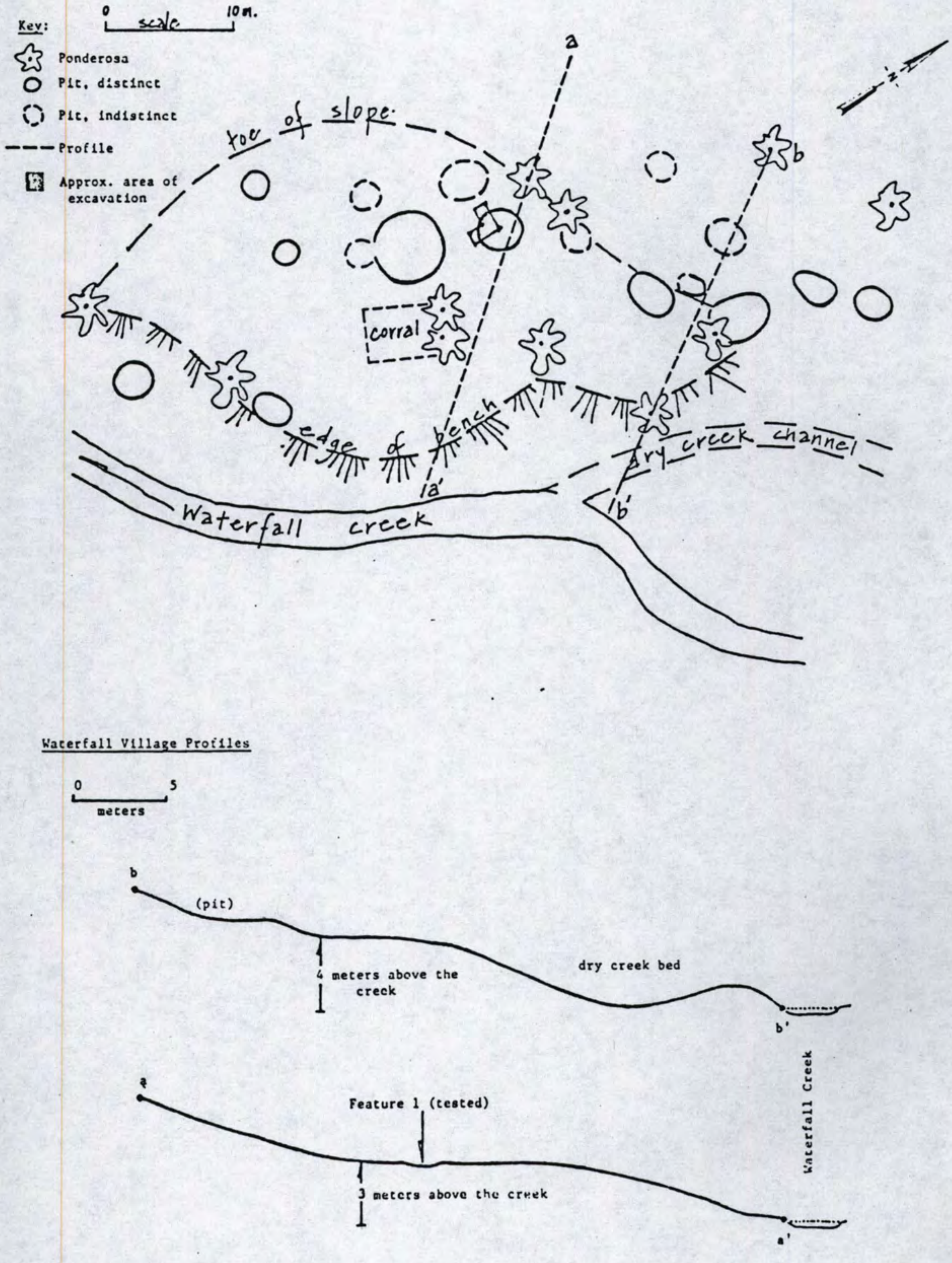


Fig. 19. Waterfall Village, SL-267, site map.

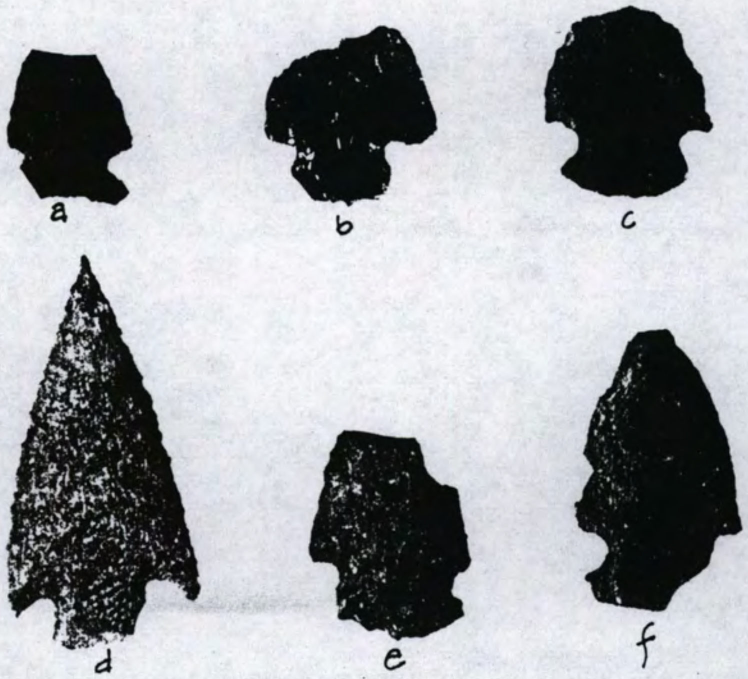


Fig. 20. Large points from Waterfall Village. Length of specimen d 4.2 cm.

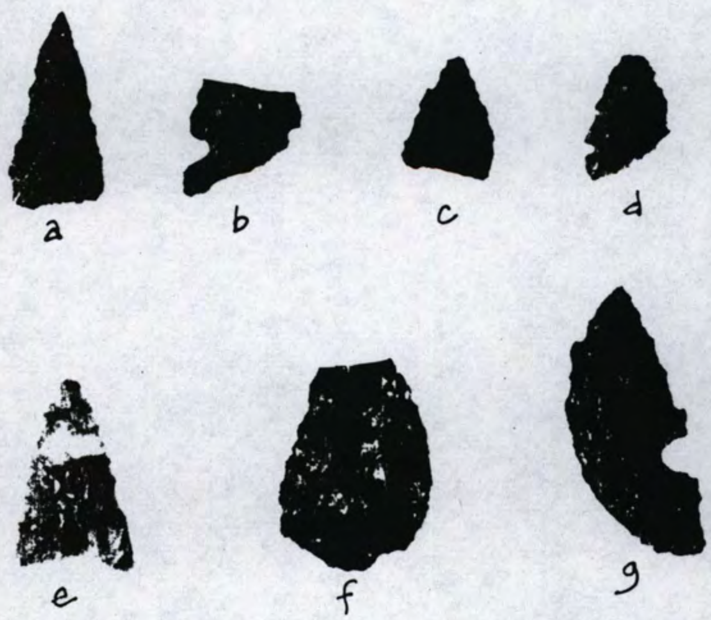


Fig. 21. Miscellaneous points from Waterfall Village. Length of specimen g 3.0 cm.

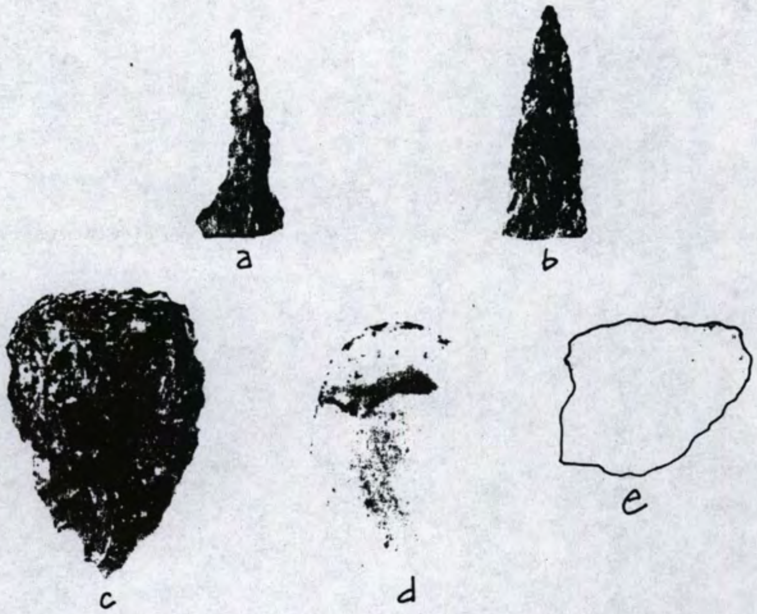


Fig. 22. Drills and scrapers from Waterfall Village.
Length of specimen c 3.5 cm.

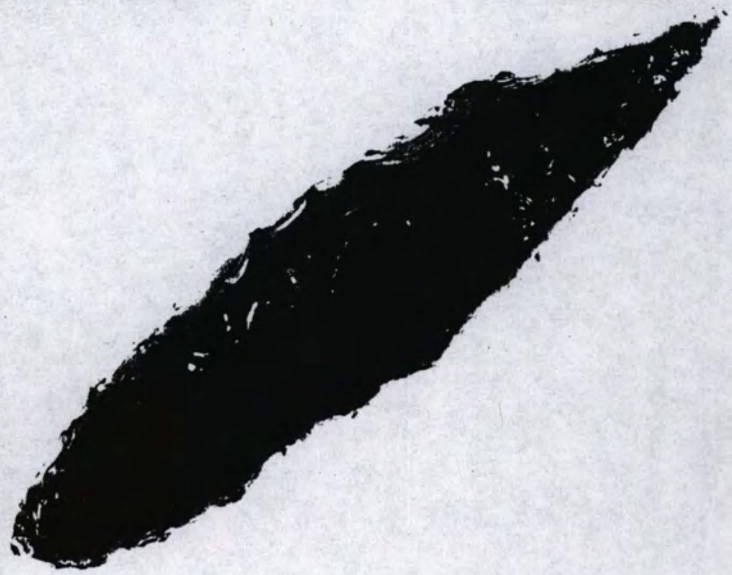
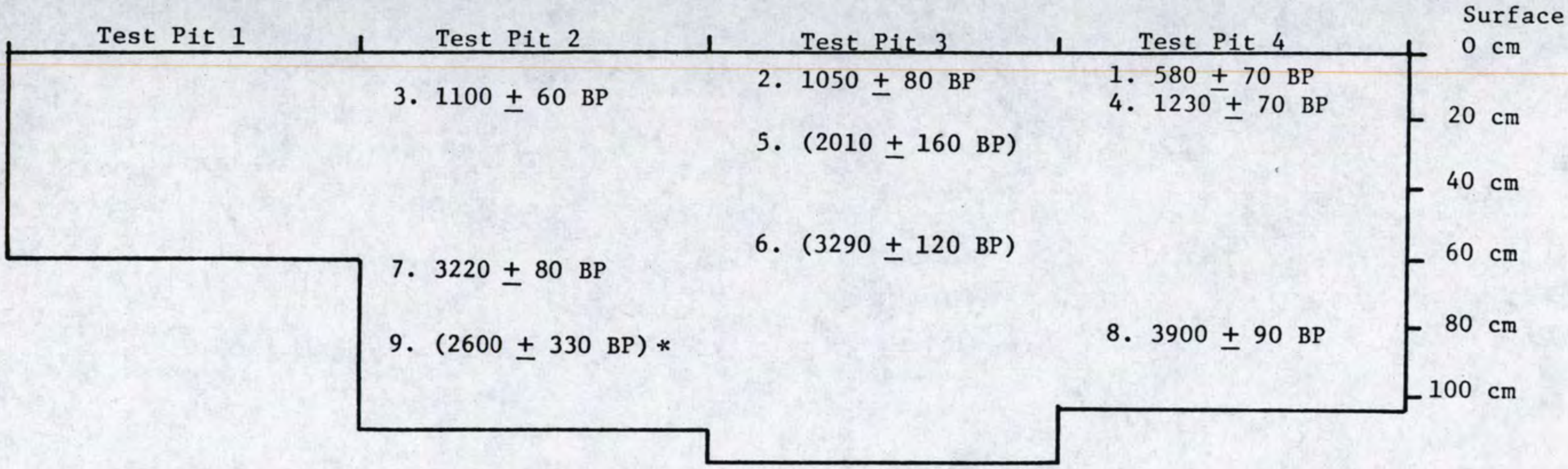


Fig. 23. Obsidian drill/awl from Waterfall Village.
Actual length 10.9 cm.

ADDENDUM - RADIOCARBON DATES FROM BIG CREEK CAVE



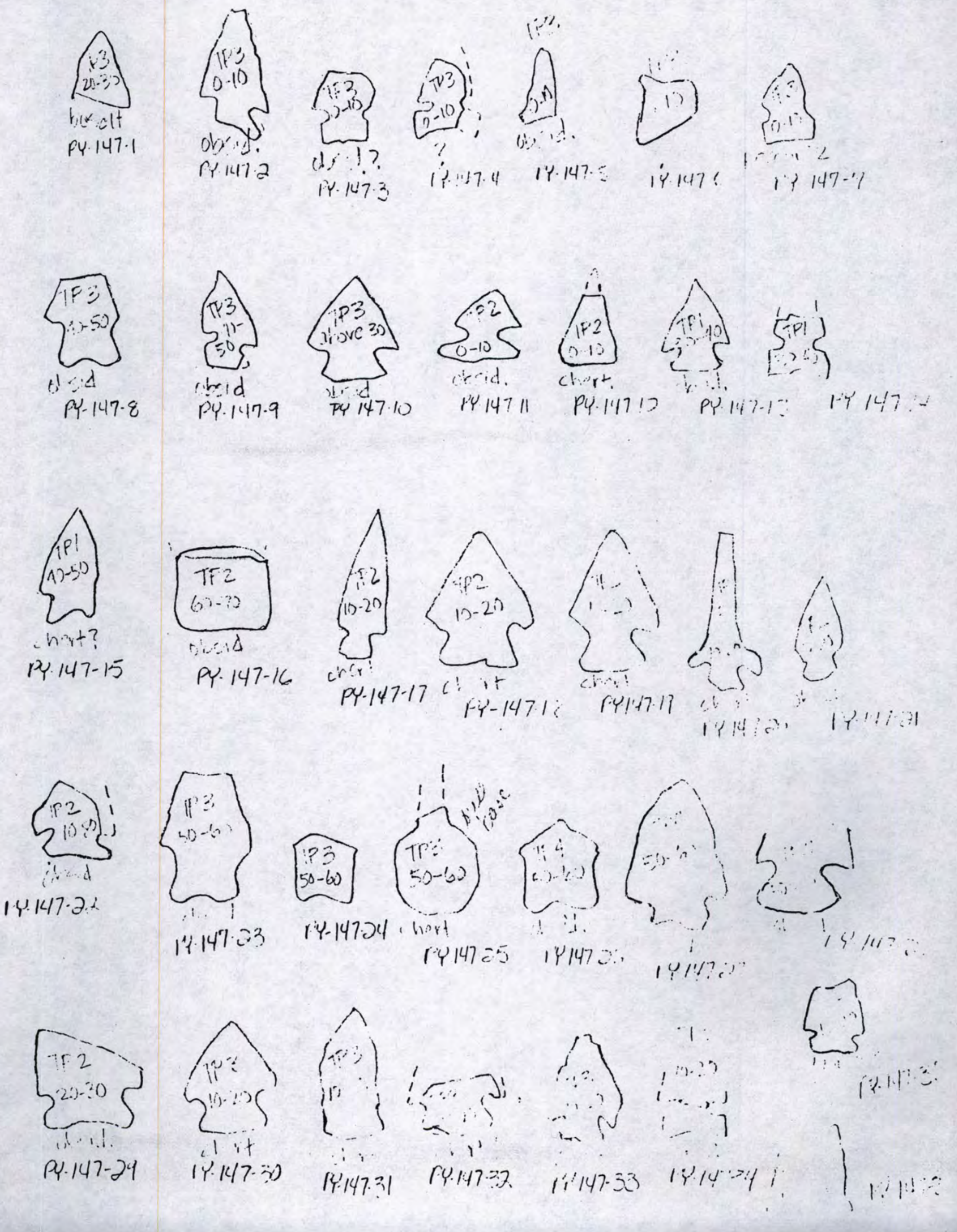
Beta-Analytic Sample Number	Date (BP)	Depth Below Surface
1. 3395	580 ± 70	3-7 cm
2. 3392	1050 ± 80	0-10 cm
3. 3391	1100 ± 60	10-20 cm
4. 3396	1230 ± 70	10-12 cm
5. 3393	(2010 ± 160)	30 cm
6. 3394	(3290 ± 120)	57-59 cm
7. 3398	3220 ± 80	60-62 cm
8. 3397	3900 ± 90	81 cm
9. 3399*	(2600 ± 330)	85 cm

All dates were processed by Beta-Analytic, Coral Gables, Florida.

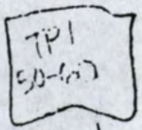
Dates in parentheses had relatively small sample sizes and correspondingly large standard deviations.

* Sample 3399 yielded the only date that is out of sequence for the profile. The sample was small, had no large chunks of carbonized material, and the tiny pieces of charcoal present were completely mixed with the sandy matrix. It was suspected that the sample might not yield a reliable date when it was submitted to Beta-Analytic.

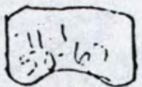
As per international conventions, dates are based on a Libby half-life of 5568 years and 95% of the activity of the NBS Oxalic Acid as the modern standard.



TP3 20-30
basalt
PY-147-1
TP3 0-10
obsid.
PY-147-2
TP3 0-10
PY-147-3
TP3 0-10
PY-147-5
TP3 0-10
TP3 10-50
PY-147-8
TP3 50
obsid
PY-147-9
TP3 above 30
PY 147-10
TP2 0-10
obsid.
PY 147 11
TP2 0-10
chert
PY 147 12
TP1
PY-147-1
TP1
TP1 40-50
chert?
PY-147-15
TP2 60-70
obsid
PY-147-16
TP2 10-20
PY-147-17
TP2 10-20
PY-147-1
PY147-1
TP2 10-20
PY-147-23
TP3 50-60
PY-147-24
chert
TP3 50-60
PY 147 25
PY147
TP2 20-30
PY-147-29
TP3 10-20
PY-147-30
TP3
PY147-31
PY-147-32
PY147-33



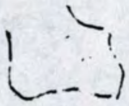
obsid.
PY-147-59

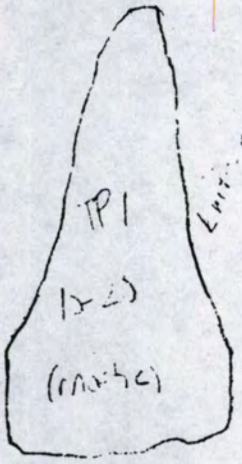


obsid.
PY-147-60

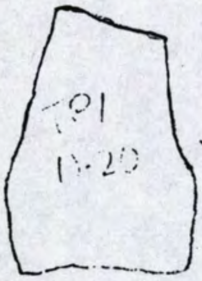
PY-147

PY-147





PY 147 65



chert
PY 147 66

surface
mouth of
cave

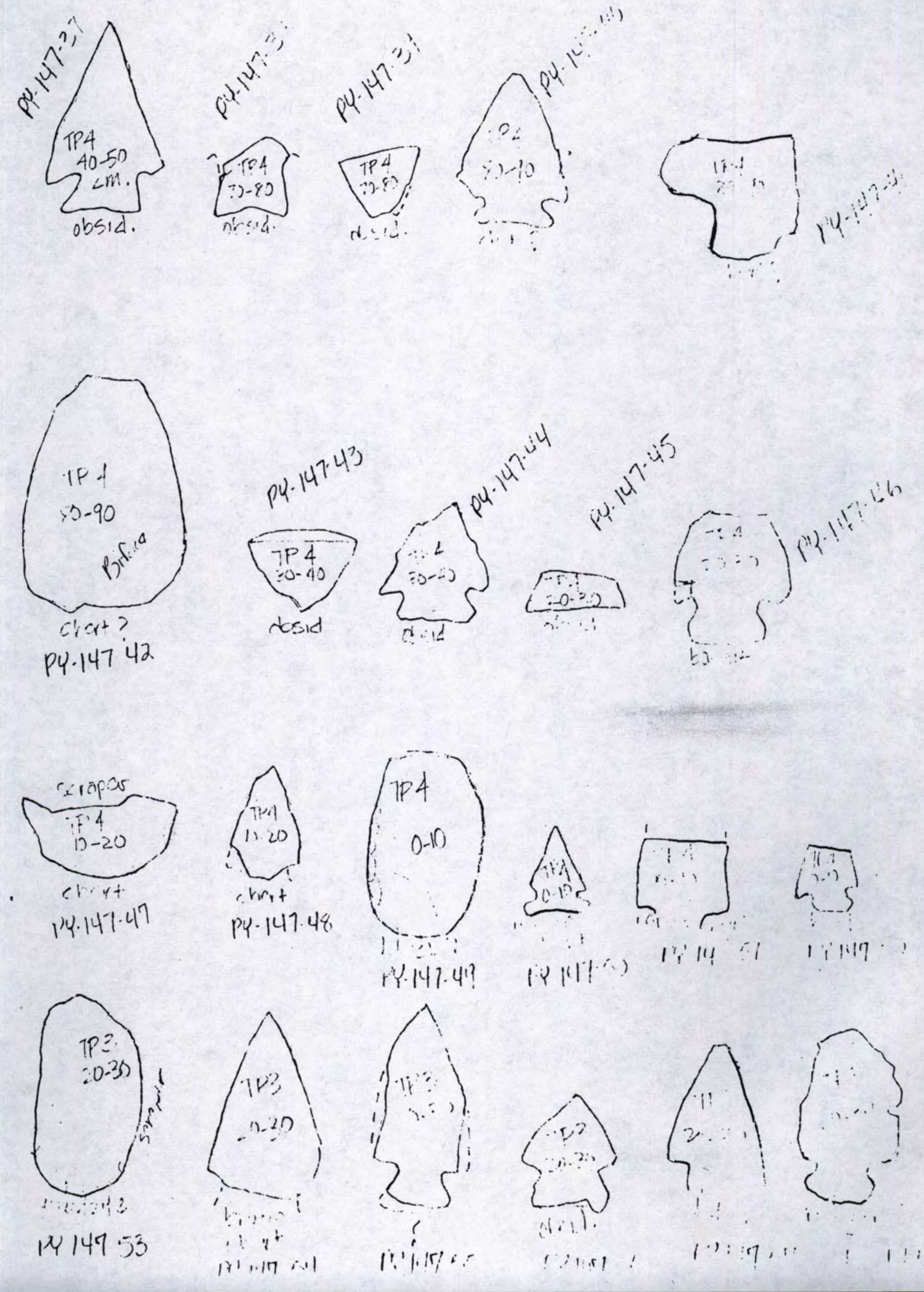
PY 147 67

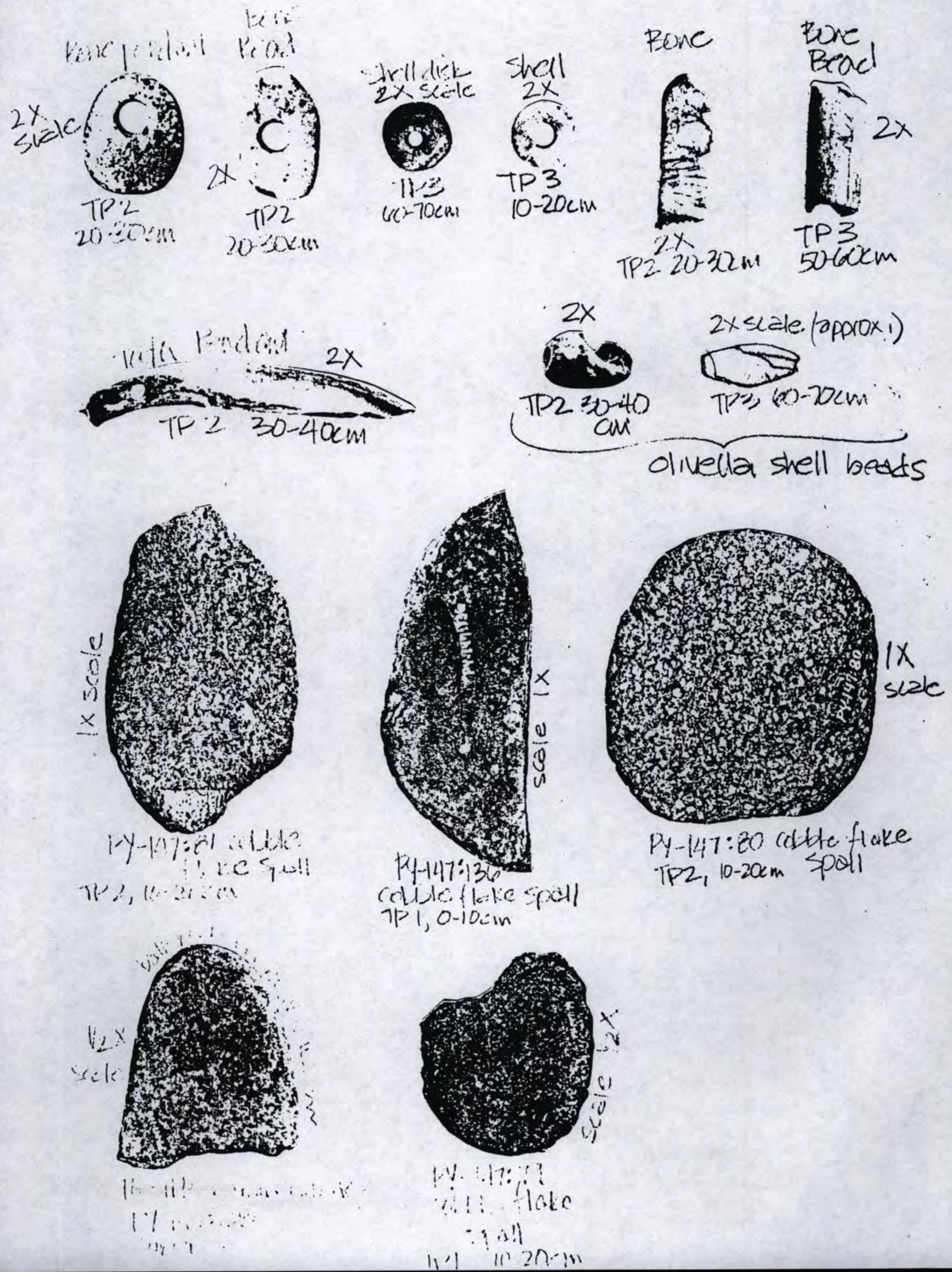
obsid.

Unprovenienced
(50-70 cm?)

PY 147

PY 147 61


PY-147-37
TP4
40-50
cm.
obsid.
TP4
70-80
PY-147-3
TP4
70-80
PY-147-42
TP 4
80-90
Biface
chert ?
PY-147-43
TP 4
30-40
obsid
PY-147-44
PY-147-45
PY-147-46
scraper
TP 4
10-20
chert
PY-147-47
TP4
10-20
chert
PY-147-48
TP4
0-10
PY-147-49
TP3
20-30
PY 147 53
TP3
20-30



2X scale
TP2 20-30cm
2X
TP2 20-30cm
Shell disk 2X scale
TP3 60-70cm
Shell 2X
TP3 10-20cm
Bone
2X TP2 20-30cm
Bone Bead
2X
TP3 50-60cm
2X
TP 2 30-40cm
2X
TP2 30-40 cm
2x scale (approx.)
TP3 60-70cm
olivella shell beads
1X scale
TP2, 10-20cm
scale 1X
PY-147:136 cobble flake spall
TP1, 0-10cm
1X scale
PY-147:80 cobble flake spall
TP2, 10-20cm
1/2X scale
scale 1/2X
flake

Small notched points - cont.

ARCHEOLOGICAL LABORATORY

USDA FOREST SERVICE — ARTIFACT ANALYSIS FORM — 2360

PROJECT ____________ SITE NUMBER PY-147

SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	BASE WIDTH	STEM LENGTH	NECK WIDTH	WING HEIGHT
PY-147:22		obsid	—	—	3.3	—	4.0	—	9.5	—
:14		basalt	—	1.0	2.6	—	12.5	8.0	6.0	8.[illegible]
4		?	(16.5)	—	2.7	—	(12)	—	5.[illegible]	[illegible]
34		obsid.	—	—	—	—	13.4	—	6.0	—
10		obsid	21.4	18.1	3.[illegible]	1.1	13.5	5.[illegible]	9.3	5.0
2		obsid.	(22)	14.0	4.0	1.0	9.3	6.8	6.2	5.[illegible]
20		[illegible]	(38)	15.2	3.3	0.9	(8)	4.5	5.[illegible]	[illegible]
33		chert	(24)	(18)	[illegible]	1.1	10	4.6	6.0	[illegible]
3		obsid.	19.0	14.7	3.[illegible]	0.7	[illegible]8	4.5	6.2	3.5
9		obsid.	11.6	11.1	2.8	0.5	8.4	—	[illegible]	—
7		basalt	5.5	—	[illegible]	0.4	11.6	6.0	5.7	—
50		chert	17.2	—	2.5	[illegible]4	13.3	[illegible]	[illegible]	—
[illegible]			—	—	[illegible]	—	10.3	—	—	
[illegible]		[illegible]	—	—	—	—	[illegible]	—	[illegible]	—
[illegible]		chert	—	[illegible]	[illegible]	—	[illegible]	—	[illegible]	—
52		[illegible]	—	[illegible]	[illegible]	—	—	—	[illegible]	—
[illegible]2			20.0	13.4	3.4	0.8	16.0	4.[illegible]	[illegible]	5.[illegible]
[illegible]		obsid	—	12.7	[illegible]	—	—	—	7.9	—
11		obsid	14.3*	—	2.5	0.4	11.3	—	7.0	—

[illegible]

Misc. Stemmed Points

Triangular Points

USDA FOREST SERVICE

ARCHEOLOGICAL LABORATORY

ARTIFACT ANALYSIS FORM

2360

PROJECT Buck Cave

SITE NUMBER PY-147

	SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	BASE WIDTH	STEM LENGTH	NECK WIDTH	WING HEIGHT
Stemmed	PY-147:7		chert	31.1	10.3	3.8	1.0	7.3	5.6	5.0	4.9
	:21		obsid	21.5	9.9	3.0	0.5	7.2	3.7	5.4	—
	:67		obsid	13.0	9.0	2.0	0.2	4.0	4.0	3.3	4.0
?	:15		chert	22.8	12.1	2.8	0.7	9.4	4.4	4.3	5.5
Triangular	PY-147:12		chert ?	(18)	12.3	2.8	0.5+	12.3	—	—	—
	:[illegible]		ign.	(29)	17.6	3.2	—	17.6	—	—	—
	:36		chert ?	(30)	18.0	2.7	—	18.0	—	—	—
[illegible]	PY-147:3		chert	25.2	9.5	4.6	1.6	12.8	—	—	—

[illegible] Points

USDA FOREST SERVICE

ARCHEOLOGICAL LABORATORY

ARTIFACT ANALYSIS FORM

2360

PROJECT Middle Fork Test - 1981

SITE NUMBER PV-147

SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	BASE WIDTH	STEM LENGTH	NECK WIDTH	WING HEIGHT
PV-147:23	Proj. Point	obsid.	—	19.0	7.0		15.2	7.8	13.6	11.5
27	"	"	—	21.0	5.9		—	—	11.0	—
8	"	"	—	15.5	4.3		13.0	7.2	10.3	7.3
26	"	"	—	—	5.0		16.0	11.6	15.0	—
59	"	"	—	—	6.0		15.8	12.3	15.6	—
63	"	"			6.0		15.2	—	12.5	—
60	"	"	—	—	5.1 +		16.8	—	—	-
33	"	"	—	—	4.8 +		14.3	9.8	12.5	—
62	"	"	—	—	—		13.7	8.8	(11.5)	—
64	"	"	—	—	5.0		14.8	—	(12.0)	
24	"	"	—	—	5.3		11.7	9.7	12.0	—
98	"	"	—	—	—		15.6	11.4	11.3	—

[illegible]

USDA FOREST SERVICE

ARCHEOLOGICAL LABORATORY

ARTIFACT ANALYSIS FORM

PROJECT Pu L. Line

( ) estimated - broken

SITE NUMBER D1-147

Large

SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	BASE WIDTH	STEM LENGTH	NECK WIDTH	WING HEIGHT
D1-147:3		obsid.	36.8	23.3	4.4	2.6	15.7	6.1	11	5.5
:47		chert	27.3	(23.5)	5.0	2.7	16.5	5.7	12.3	7.4
56		obsid.	21.7	18.3	4.3	1.5	15.8	6.4	11.9	7.8
19		chert	29.0	(14.5)	4.2	2.1	14.6	7.3	10.3	7.1
44		obsid	(29)	21.5	5.3	2.4	(15.3)	6.9	12.8	7.1
46		basalt	(33)	23.5	6.0	4.0	15.6	8.2	12.3	8.1
20		chert	22.6	11.1	5.2	2.0	14.6	7.5	[illegible]	8.0
27		obsid.	—	19.7	4.7	—	16.9	7.3	9.3	7.8
55		?	(40)	(18)	4.7	3.0+	—	—	9.4	—
58		?	—	(22)	6.4	—	12.8	6.4	12.5	8.2
40		?	(30)	(23)	3.3	1.8	16.3	4.5	13.4	6.0
29		obsid.	—	21.3	3.8	—	17.5	7.0	14.3	7.3

Scrapers

USDA FOREST SERVICE

ARCHEOLOGICAL LABORATORY

ARTIFACT ANALYSIS FORM

2360

PROJECT ____________________

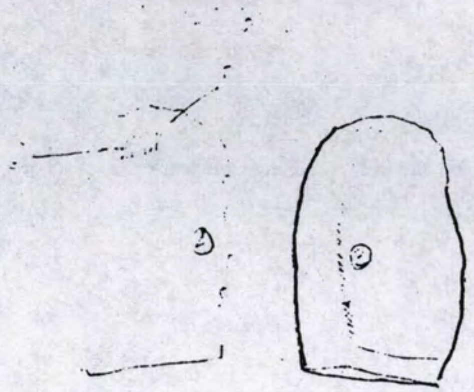
SITE NUMBER PY-147

SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	~~BASE WIDTH~~ Edge angle	~~STEM LENGTH~~ Use-wear	~~NECK WIDTH~~	~~WING HEIGHT~~
PY-147: 61		chert	35	22	7	5.3	75-85	① light polish ② heavy polish ③ heavy apex abrasion ④ [illegible]		
53		quartzite	38	21	9	7.0	80-90	③ heavy apex abrasion - dorsal		
115		chert	38	27	10	7.4	70-85	① lite abrasion & polish - apex		
49		?	35	24	12	10.6	75-85	[illegible] micro-fractured (use? [illegible])		
? 25	poss. drill handle?	chert	22	17	5	2.2	65-75	① lite edge abrasion		
47		chert?	—	—	7	—	85-95	① med abrasion ② lite polish ③ lite - med edge abrasion.		
91		chert	—	—	10	—	75-90	None.		

Note:

Little or no classic side-removing edge abrasion & polish. Edges [illegible] [illegible]

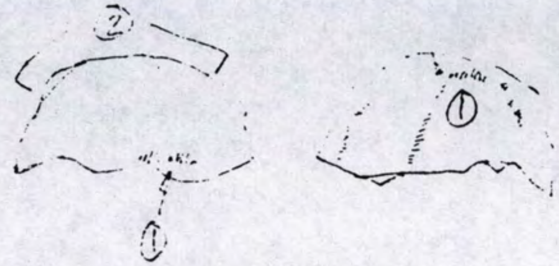
— sketches on reverse —



P1-147:53

P1-197:115

P1-147:47



P1-147:25

Celt – [illegible]

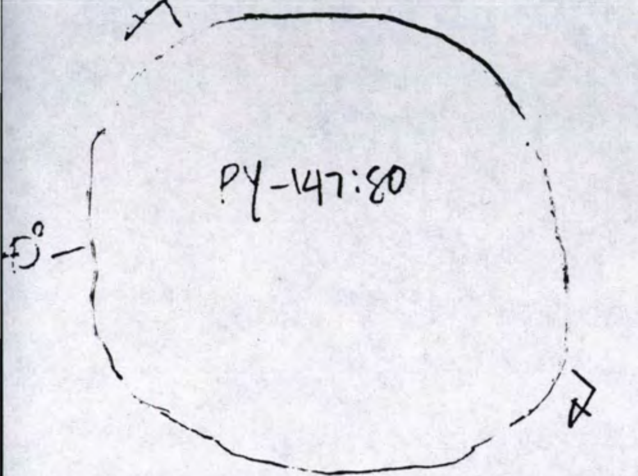
USDA FOREST SERVICE

ARCHEOLOGICAL LABORATORY
ARTIFACT ANALYSIS FORM

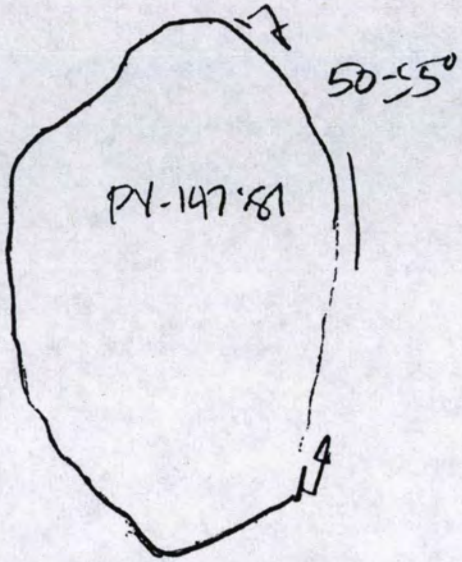
PROJECT ______________

SITE NUMBER ______________

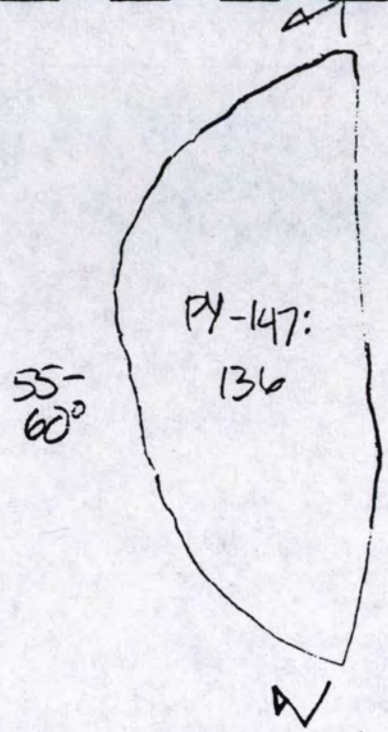
SPECIMEN NO.	ARTIFACT TYPE	MATERIAL	LENGTH	WIDTH	THICKNESS	WEIGHT	BASE WIDTH	STEM LENGTH	NECK WIDTH	WING HEIGHT
PY-147:80			62.0	58.3	11.8	52.3				
PY-147:81			69.3	41.4	6.2	22.2				
PY-147:130			79.2	31.7	8.4	27.4				
PY-147:79			86.2	76.7	16.9	13.2				
May not be a tool										



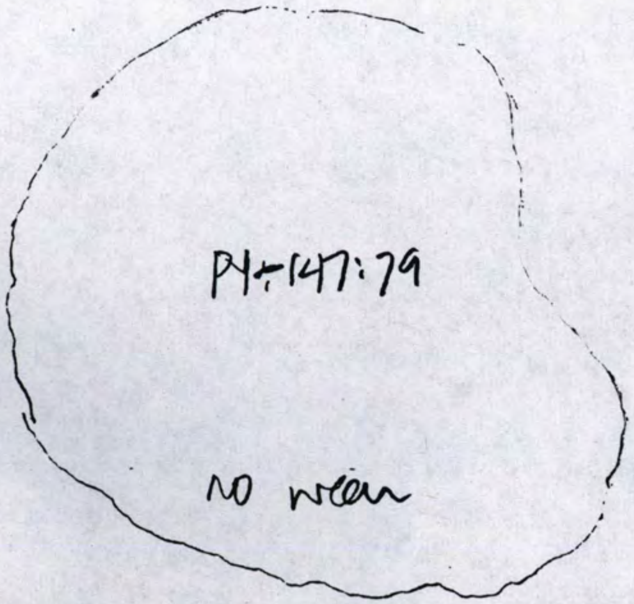
Mod-heavy edge abrasion & some ⊥ striations.



Lite-mod. edge abrasion w/some lite polish. Most wear on projections



Mod-heavy edge abrasion - mostly on projections



FAUNAL ANALYSIS OF BIG CREEK CAVE, IDAHO
PRELIMINARY REPORT
(10VY67)

Elizabeth Manion

Introduction

This report describes the faunal analysis from the 1981 test excavation of the Big Creek Cave site in Idaho (10VY67) conducted by representatives of the U. S. Forest Service. The collection included 3818 specimens of which six were modified for both utilitarian and apparent non-utilitarian use. The remaining 3814 specimens were unmodified apart from primary and possible secondary attritional processes.

Methods

Bones were identified by direct comparison with the skeletal collection at the University of Utah Archeology Center and the Utah State Historical Society, Antiquities Division. Fish species were identified by Dr. Gerald Smith, Curator of Paleontology, University of Michigan and Dr. Dennis Bramble, Professor of Biology, University of Utah. Consultations concerning enigmatic bone fragments were made with Dr. James Madsen, Utah State Paleontologist, and Kenneth Juell, Department of Anthropology, University of Utah.

All bones were identified to species when possible or to other taxonomic catagories. Unidentifiable mammal bones were classified as either Mamalia, large; Mamalia, medium; or Mamalia, small based on bone size and thickness. Mamalia, large included mammals larger than a coyote. Mamalia, medium included mammals between, and including, jack rabbit to coyote size. Mamalia, small included mammals smaller than a jack rabbit.

The minimum number of individuals (MNI) was calculated by totaling the most frequently occuring element for each species with regards to symmetry and location of that fragment on the bone in consideration. Using this method, it was determined that the MNI present in the entire deposit was 27. This number, being the lowest figure for the MNI, does not account for stratigraphic correlation of the fauna to the cultural deposits of (possible) different occupations through time. (The correlation of fauna to stratigraphic layers could not be made as the Cave was excavated in 10cm arbitrary levels and the information relating the two is not yet available.) In addition, the determination of the MNI using this method does not account for the possibility that the fauna (such as mountain sheep and mule-deer) may not have been taken back whole, but rather in half or in quarters.

Of the 27 identified individuals, 8 were mountain sheep (Ovis canadensis), and 2 were mule deer (Odocoileus hemionus). The remaining 17 individuals represented the presence of elk, (c.f. Cervus canadensis), antelope (Antilocapra americana), yellow-bellied marmot (Marmot flaviventris), ground squirrel (c.f. Spermophilus sp.), jack rabbit (Lepus californicus), dog/coyote (Canis sp.), common flicker (c.f. Colaptes sp.), chinook salmon (Oncorhynchis tshawytscha), mountain white fish (Prosopium williamsoni), and squawfish (Ptychocheilus oregonensis) (Table 1).

Unworked bone

The unmodified bone was analyzed for primary and secondary attritional processes. Primary attritional processes were observed in the form of cut marks and burning, both resultants of butchering and consumption practices. Secondary attritional processes were observed in the form of gnaw marks on the bone made by other fauna such as rodents and carnivores. Observations were done firstly by gross analysis and secondly by viewing possible cut and/or gnawed bone under 20x magnification. When bone fragments could be correctly oriented anatomically, they were measured for maximum length using a sliding caliper instrument.

Of the unmodified bone, 263 were identified at genus or species level and 590 were identified to class (Table 1). One hundred and ninety of the identified bone represented mountain sheep. The remaining bone represented species previously mentioned in addition to an assortment of unidentified Mamalia, small and medium, and Aves. The majority of Artiodactyla (even-toed Ungulates) long bone fragments probably represented mountain sheep or mule deer. A determination for either species could not be made from the bones present as bone fragments ranged from 1 to 5cm in length and 0.5 to 1.5cm in width, and diagnostic landmarks such as articular surfaces or major muscle attachments were not present.

Most of the unmodified bone was a diverse range of Artiodactyla bone and long bone fragments from large mammals. Cut marks were observed on 175 bone fragments (4.6% of the collection). The cut marks usually occured near an articular surface where major muscle attachments are located. Most of the cut marks were diagonal to the anatomically oriented bone and a few cut marks were horizontally oriented. Evidence of burning was observed on 1221 bones (32% of the collection). Observation of secondary attritional processes occured at a low frequency throughout the deposit.

Modified bone

Five worked bone specimens and one worked wood specimen were recovered from the Big Creek Cave faunal collection. None of the artifacts were complete. Two of the specimens were bone awl tip fragments which appeared to have broken from longer specimens. Both artifacts had triangular shaped tips, were shaped and smoothed, and were weather-worn.

Two of the worked bone fragments appeared to be non-utilitarian artifacts. Both are similiar to large bone beads. They are both from long bone shafts and were highly polished and smoothed. The specimens appeared to have been burned before modification. In addition, both showed at least one extremity of the long axis which displayed a smoothed and very thin rim.

The remaining two specimens were enigmatic in nature. One, a wood specimen, had a rounded extremity and was 'rubbed' or ground smooth. The longitudinal axis of the specimen was rocker-shaped. The other specimen was an amorphously shaped artifact from a long bone. It was similiar to the wood specimen as it too had an extremity which was both rounded and smoothed. Observation of the bone matrix showed the artifact to come from the extremity and shaft of a long bone.

Discussion and Summary

Interestingly, there was a noticeable shift of faunal composition in the deposit. It appeared that from the surface to 60cm below modern surface (BMS), there was a more diverse range of fauna in Test Pits 1, 2, and 3. This fauna included mountain sheep, mule deer, elk, antilope, dog/coyote, yellow-bellied marmmot, ground squirrel, jack rabbit, bird, and fish in addition to Artiodactyla, Rodentia, and Mamalia, large, medium and small, Test Pit 4 from the surface to 60cm BMS contained only two identified species, mountain sheep and mule deer, and an assortment of Artiodactyla bone.

After 60cm BMS, Test Pit 1 appeared to no longer contain faunal bone (information to the contrary is unknown) and Test Pit 4 became as rich in fauna as was Test Pit 1. During this 'transition', Test Pits 2 and 3 remained relatively the same in faunal composition.

Other observed shifts also occured throughout the deposit. One was the absence of identified mule deer past 80cm BMS. Another was the absence of yellow-bellied marmmot at any level in Test Pit 4 and occuring more frequently from the surface to 70cm BMS. A third observed shift, or in this case, a frequency of occurance, was the location of fish bone. Fish was present from 10 to 110cm BMS. The majority of identified bone occured in Test Pits 1, 2, and 3 from 50 to 60cm BMS. The fish included 4 chinook salmon; a 20lb salmon measuring 80cm; a 30lb salmon; a 28lb salmon, one meter long; and a 5lb salmon. The mountain white fish was estimated as weighing one pound.

Continuing research of the faunal collection from Big Creek Cave, Idaho is being conducted at the University of Utah, Archeology Center. It is anticipated that further research will increase the knowledge about faunal processing for food or other purposes, that an understanding of the fauna present at various stratigraphic levels at certain times will increase the understanding of diet breadth for the various occupations, and that knowledge will be gained about both the (possibly) more accurate figure of the MNI once the arbitrary levels are related to stratigraphic layers, and the effect secondary attritional processes had on the faunal collection.

TABLE I
Big Creek Cave, Idaho
Taxa identified and calculated minimum
number of individuals for the site collection

TAXON	no. bones	MNI
Mammalia, large	2293	-
Mammalia, medium	6	-
Mammalia, small	43	-
Artiodactyla (even toed ungulates)	585	-
Rodentia	2	-
Aves	3	-
Amphibia	1	-
mountain sheep (<u>Ovis</u> <u>canadensis</u>)	190	8
mule deer (<u>Odocoileus</u> <u>hemionus</u>)	24	2
antelope (<u>Antilocapra</u> <u>americana</u>)	1	1
elk (c.f. <u>Cervus</u> <u>canadensis</u>)	1	1
dog/coyote (<u>Canis</u> sp.)	2	1
yellow bellied marmot (<u>Marmot</u> <u>flaviventris</u>)	7	3
ground squirrel (<u>Spermophilus</u> sp.)	2	1
jack rabbit (<u>Lepus</u> <u>californicus</u>)	10	2
woodrat (<u>Neotoma</u> sp.)	1	1
common flicker (c.f. <u>Colaptes</u> sp)	1	1

Table I continued

TAXON	no. bone	MNI
chinook salmon (*Oncorhynchus tshawytscha*)	13	4
mountain white fish (*Prosopium williamsoni*)	7	1
Squawfish (*Ptychocheilus oregonensis*)	1	1
large salmon (*Oncorhynchus* sp.)	2	1
TOTALS	3190	27

Mammalia, medium unidentified	2
Mammalia, small unidentified	14
unidentifiable faunal bone	617
TOTAL	623

*cut bone = 175 fragments, 4.6% of the faunal collection
burned bone = 1221 fragments, 32% of the faunal collection

POLLEN RESULTS FROM BIG CREEK CAVE, CENTRAL IDAHO, AND 42SV981, CENTRAL UTAH

Jannifer Wyatt Gish
Quaternary Palynology Research Facility
Littleton, Colorado July, 1982
Report to the USDA Forest Service,
Ogden, Utah

List of Figures and Tables

Introduction

The Big Creek Cave site is situated near the confluence of Big Creek and the Middle Fork of the Salmon River in Payette National Forest, Central Idaho. Site elavation is about 3400 feet, and the surrounding predominant plant community is lower montane coniferous forest. Ten pollen samples were evaluated from a column in Test Pit 2 (T.P. 2) within the cave. Site 42SV981 or the Alpha Omega site is located in Paradise Valley in Fishlake National Forest, Central Utah. Site elevation is about 8000 feet, and the plant community in the site vicinity is sagebrush grassland. Six pollen samples were evaluated from this site. The primary objectives of both studies were evaluations of pollen research potential and preliminary environmental interpretations. Both sites were excavated by the U.S.D.A. Forest Service, Ogden, Utah. Information referred to in this report was provided by Thomas Scott, Project Director.

Methods

The sixteen pollen samples were processed by Palynological Analysts of Montrose, Colorado. A heavy liquid flotation technique was used (Scott 1978:2-4). Each sample was deflocculated in a weak hydrochloric acid solution. After screening, zinc bromide (density 2.0) was used in the flotation process. Siliceous residues were removed by hydrofluoric acid treatments; and organic debris was removed by acetolysis.

The microscopic analysis and the interpretation were conducted by Quaternary Palynology Research of Littleton, Colorado. Combined 200 grain arboreal pollen (AP) and non-arboreal pollen (NAP) counts were made when possible. Pollen preservation was generally fair at both sites; densities were low to abundant. The pollen results from Big Creek Cave and 42SV981 are expressed as frequencies in Figures 1 and 3. In Figure 1, the pines are divided into Small Pinus, Large Pinus, and Pinus fragments. The pines are differentiated on the basis of size, with the Small Pinus category including grains with a body length (corpus breadth) of 45μ or less (Gish 1978:3). Pinus monophylla, a nut pine, would be included in the small pine category, and Pinus ponderosa and P. flexilis in the large pine category. The spore frequencies in Figure 1 are relative to the sum of both pollen and spores. Figure 2 illustrates the proportion of AP to NAP in the samples from Big Creek Cave. In Figure 3, raw data instead of frequencies are provided for samples 5 and 6 since the pollen sums were too low to be statistically reliable (Gish 1978:Fig. 1). Also the small and large pine categories are referred to as Pinus edulis-type and P. ponderosa since these are the major contributors of the pollen.

In addition to counts, the entire slide for each sample was scanned at 100X to identify additional pollen categories. Occurrences of pollen aggregates were also systematically recorded. Aggregates are clumps of the same pollen type. They are generally indicative of short distance pollen dispersal or actual introduction of plant parts into a context, and are useful in both environmental and ethnobotanic interpretations. In accordance with customary practice, aggregates were tabulated as single grains in the counts.

However, separate listings of the occurrences are provided in Tables 1 and 2. A designation such as "Low-6b" signifies that no more than five (b) Low-spine Compositae aggregates were observed during the count, and the largest aggregate consisted of six pollen grains. A designation in paranthesis indicates the aggregate was observed in scanning. All other aggregates were observed during the 100 or 200 grain counts. Abbreviations used in the figures and tables are listed in Tables 1 and 2.

Analysis

Big Creek Cave

Big Creek Cave occurs in a south-facing canyon wall about 20m above Big Creek which is a permanent tributary of the Middle Fork of the Salmon River. The predominant plant community is lower montane coniferous forest, with distribution of certain elements controlled by direction of slope. The arboreals include Pseudotsuga menziesii (Douglas fir), Pinus flexilis (limber pine), P. contorta (lodgepole pine), and P. ponderosa (ponderosa pine). Shrubs include Artemisia sp. (sagebrush), Prunus virgiana (common chokecherry), Rosa woodsii (wild rose), and Cercocarpus intricatus (little-leaf mountain mahogany). Grasses include Agropyron sp. (wheatgrass), and Bromus inermis (brome grass). Douglas fir predominates on north-facing slopes, and sagebrush predominates on the drier south-facing slopes. Mosses occur near the cave entrance and ferns were observed along seeps not far from the cave. Alnus sp. (alder) and other hardwoods were observed along Big Creek.

The cave is about 12X6m by 2m in maximum height with an overhang at the entrance. The cave is dry with deposits dry throughout, and very little rodent burrowing. Soil type was a dark brown, ash and charcoal-stained sand with cultural debris throughout the depth of the material. Debris included shell, lithic debitage, and bone (Table 1). The opening of the cave was partially blocked by post-occupation rock fall. Some looting was in evidence, but the excavations involved undisturbed deposits.

The 10 pollen samples encompass deposits which range in time from about 4000 B.P. to 500 B.P., from the Archaic of Central Idaho to Shoshonean occupation. Modern surface control samples from outside the cave have not yet been evaluated. Pollen preservation was generally fair in the cave deposits. However, in four samples only 100 grain counts were obtained. The pollen in these levels was more poorly preserved, and relatively scarce. Good pollen preservation tended to correspond with high estimated numbers of grains observed (Table 1). Apparently, during certain periods of soil accumulation, pollen was exposed to factors of degradation which were not as influential during other periods. At present, there is no obvious pattern of underrepresentation of a particular pollen category or categories due to differential preservation.

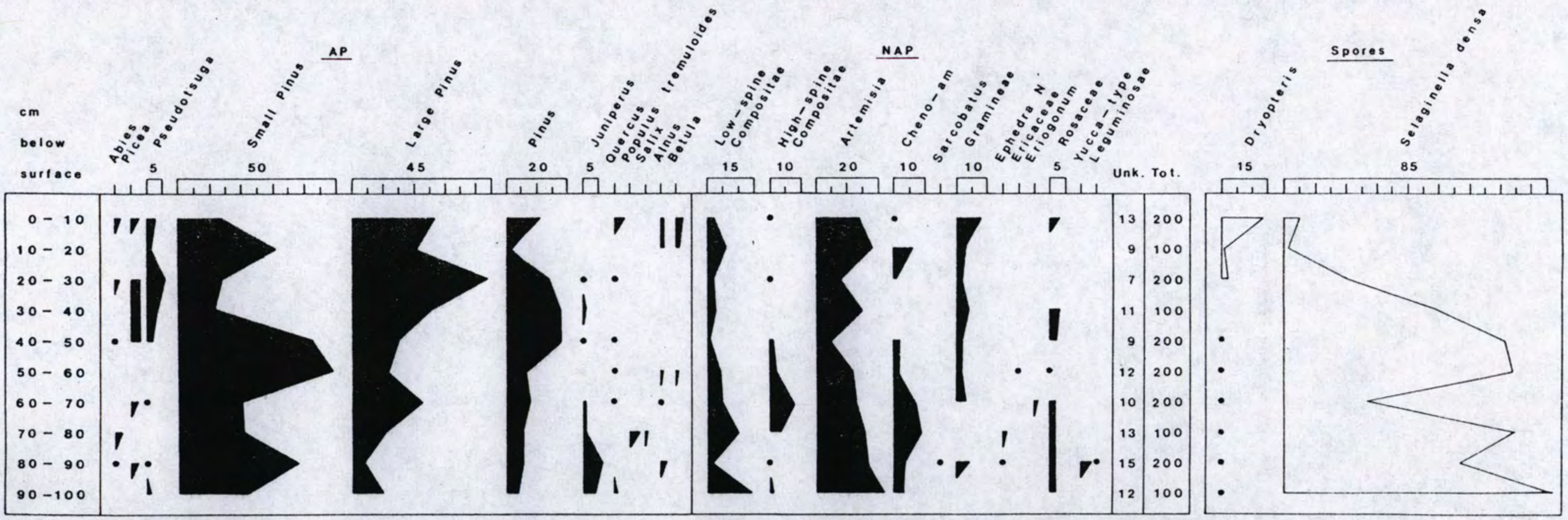
In general, the cave pollen records suggest an environment and vegetation pattern similar to that which exists today, a lower montane coniferous forest with a shrub understory. This is indicated by such diagnostic attributes as the high frequencies of _Pinus_ categories throughout the pollen column, and the consistent representations of _Pseudotsuga_, _Artemisia_, and

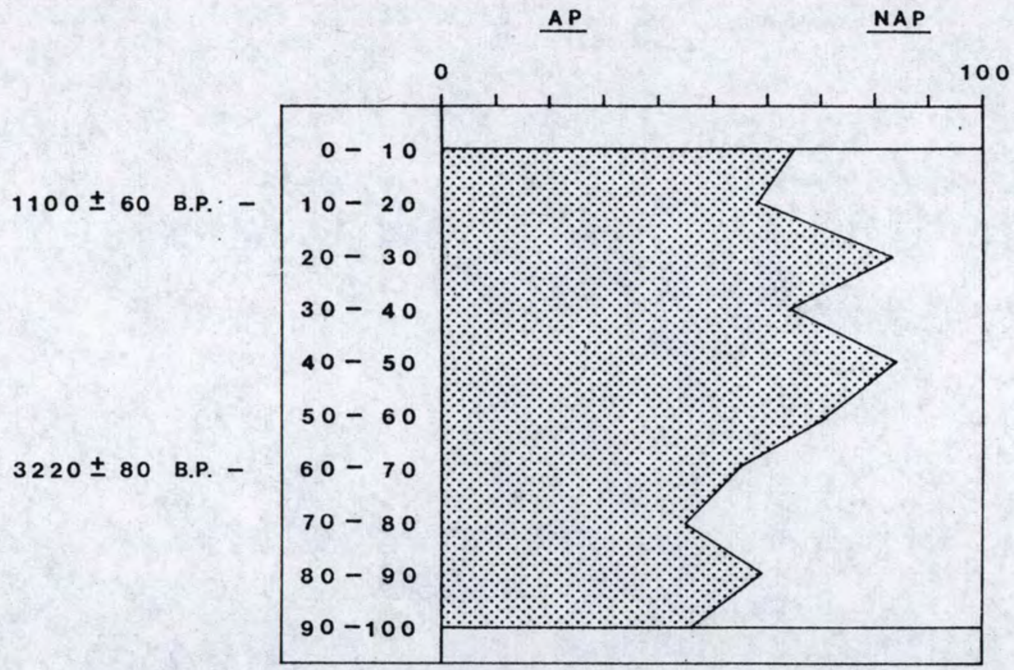
Rosaceae pollen. However, there are some interesting exceptions to this general picture; and it is helpful to consider the significance of each pollen category.

All of the arboreal pollen categories represented in the Big Creek Cave column (Figure 1) are anemophilous, with the exception of Salix which is also entomophilous (Martin 1963:73-74). The infrequent representations of Abies (fir) and Picea (spruce) pollen in the records probably reflect wind transport from nearby elements of upper montane coniferous forest (Shelford 1974:155). Elevations reach 6000 feet within two miles of the site and attain 8000 feet within 10 miles to the southeast of the site. The Pseudotsuga and pine pollen are local representations. The proximity of pine in particular is substantiated by the occurrence of several pine pollen aggregates (Table 1). The Juniperus (juniper) and Quercus (oak) pollen categories also reflect long-distance wind transport of pollen. Junipers today are found in the Snake River region in southern Idaho but are much more common further to the south (Davis 1952:7). Quercus does not occur in the flora of Idaho today (Davis 1952:7). Oak is an abundant pollen producer and the pollen source is probably also to the south where oak stands are well developed (Butler 1978:26). Populus tremuloides (trembling aspen) pollen (3%) was recorded in only one sample. Trembling aspen is a successional species often associated with recovery from fire (Shelford 1974:138-139). Swain (1973:394), using very narrow interval sampling (1cm representing 10 years), found that, in boreal coniferous forest, pollen frequencies of sprouter species such as aspen did increase after fire but that the conifers generally reasserted their dominance in about 20-30 years. It seems possible that the abrupt representation of aspen pollen at Big Creek Cave reflects the aftermath of a fire in the region. The aspen occurrence however, could have other environmental implications which are discussed later. The single Salix (willow) representation occurs in the same sample as the aspen, but probably reflects local presence of riparian flora along the creek and river. Alnus and Betula (birch) pollen appear in several samples. Both plants characteristically occur along streams in Idaho. Alder was observed growing along Big Creek today.

In the NAP, the majority of categories are consistent with the flora of a lower montane coniferous forest. These include the Compositae, Cheno-am, Gramineae, and Rosaceae categories. Sagebrush and members of the Rosaceae are common in the cave vicinity today. Certain categories, however, are not consistent with this vegetation pattern. These are Sarcobatus (greasewood), Ephedra nevadensis-type (joint fir), and Yucca-type. The first two categories are anemophilous while yucca is entomophilous. Although both Sarcobatus and Ephedra are wind-pollinated, modern pollen rain studies show that pollen presence tends to correlate well with plant presence (Gish 1979:15). Yucca is in the Liliaceae family which is well represented in Idaho by 21 different genera (Davis 1952:183-184), and includes such edible species as Camassia quamash (Davis 1952:194). Not all of the genera are morphologically distinct and, it is possible that a genus other than yucca is reflected. Neither Ephedra nor Yucca is listed in the flora of Idaho today (Davis 1952). One species of Sarcobatus (S. vermiculatus) is found in the southern part of the state (Davis 1952:268). Ephedra, Yucca, and Sarcobatus can be found together in cold desert and semi-desert communities of the southwest (Shelford 1974:261-263, Elmore 1976:42, Webber 1953:2-3, Harrington 1967:336). Cold desert and semi-desert communities, although of different floristic composition, extend into southern Idaho today (Shelford 1974:261). This includes the sagebrush-grassland of the Snake River Plain (Davis 1952:3). Isolated areas of similar flora, which Davis calls "mountain parks" (1952:4) can be found within the mountains. Davis (1952:4) explains that mountain parks are "...island-like areas of grassland or semi-desert vegetation which are able to maintain their existence within a forest region due to some peculiarity of soil or microclimate." Shelford (1974:263) also comments that certain constituents of the cold desert, such as Ephedra viridis (which has an Ephedra N-type pollen form), are "...limited to particular types of substrata." Ephedra viridis is often found in dry, rocky places (Cronquist et al 1972:248). Yuccas occur in sandy to rocky, dry or sometimes moist, well-drained, sometimes saline soils (Webber 1953:3); and Sarcobatus occurs in moist saline soils (Davis 1952:268, Kearney, Peebles et al 1960:262). When occurring together yucca and joint fir are frequently found on better-drained raised areas with greasewood in the more poorly drained areas of a particular location. Davis (1952:4) further remarks that there is "... a general rule that the vegetation of mountain parks in any particular part of the Rockies is of a type closely similar to that of the unforested basal plain which lies adjacent to the base of the mountains." In the Big Creek Cave pollen samples the presence of the semi-desert indicators corresponds to a slightly greater importance of NAP in the deeper samples (Figure 2). This is in part accounted for by greater representations of High-spine Compositae and Cheno-am pollen. The highest frequency of <u>Artemisia</u> pollen in the column appears in the deepest sample. In the AP, juniper values are also slightly higher in the deeper samples. The pine categories and Douglas fir are correspondingly less important. These deeper samples suggest a transitional stage at the end of a different vegetational and climatic period. The 50-60cm level in the pollen diagram, dating to between 2010±160 B.P. and 3220± B.P. (Wylie et al 1981:5) marks the decline in the NAP distinctions.

Butler (1978:43-44) proposes a sequence of nine climatic-ecologic periods for the Upper Snake and Salmon River country of Idaho. The period from 7200-3800 B.P. is a trend towards increasing warmth and dryness with the maximum reached about 3800 B.P. The period from 3800-2800 B.P. is a cooler, more moist time. From 2800-650 B.P. there is increasing warmth and dryness again. These different periods were interrupted by shorter climatic cycles apparent through tree-ring studies (Butler 1978:45). The beginning of the Big Creek pollen record coincides with the maximum time of warmth and dryness which is the end of the altithermal (Martin 1963:62). In regions dominated by winter precipitation, such as


cm
below
surface
AP
Abies
Picea
Pseudotsuga
Small Pinus
Large Pinus
Pinus
Juniperus
Quercus
Populus
Salix
Alnus
Betula
tremuloides
NAP
Low-spine Compositae
High-spine Compositae
Artemisia
Cheno-am
Sarcobatus
Gramineae
Ephedra N.
Ericaceae
Eriogonum
Rosaceae
Yucca-type
Leguminosae
Spores
Dryopteris
Selaginella densa
5
50
45
20
5
15
10
20
10
10
5
15
85
Unk. Tot.
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100
13 200
9 100
7 200
11 100
9 200
12 200
10 200
13 100
15 200
12 100


AP
NAP
0
100
0 – 10
1100 ± 60 B.P. –
10 – 20
20 – 30
30 – 40
40 – 50
50 – 60
3220 ± 80 B.P. –
60 – 70
70 – 80
80 – 90
90 –100

the semi-desert regions of Idaho (Butler 1978:24), the authorities agree that this definitely would have been a time of increased aridity (Martin 1963:67, Wells 1970:195). It is feasible to suggest that the deeper Big Creek Cave records reflect a time when semi-desert vegetation extended further north into Idaho than it does today due to warm dry conditions. Components such as Ephedra, Yucca and Sarcobatus could have occurred on the basal plains and also could have become established in mountain park habitats within the mountains. There is evidence that yuccas were more widely distributed in the past than they are today (Cronquist et al 1972:35, Webber 1953:10). Like Davis (1952:4) Cronquist et al (1972:5) comment on the existence of mountain parks, or as they term them "intermountain islands". Cronquist et al (1972:5) state, "The various island habitats in the Intermountain Region have expanded and merged, contracted and broken up, disappeared and reappeared, during Pleistocene and post-Pleistocene time because of changes in the Climate." Hence it seems feasible to suggest that during the altithermal in central Idaho, semi-desert edapho-climatic communities existed that have since disappeared. The cooler period following the altithermal probably caused a retreat of semi-desert vegetation with the regional extinction of certain plants such as Ephedra and Yucca. The abundance of the plants was probably never great, and the fact that they persisted at all probably relates to their ability to survive under edaphic conditions which are stressful to so many other plants. The trembling aspen pollen in the 70-80cm level is also understandable from this perspective. In Boreal Coniferous Forest, aspen stands at the edge of woodland frequently reflect the first stage of invasion of grassland by coniferous forest (Shelford 1974:123). Possibly the aspen pollen in Big Creek Cave reflects the beginning of montane coniferous forest invasion of the semi-desert communities in response to the cooler, more moist conditions in post-altithermal times.

There are three other NAP categories represented in the deeper cave samples which neither necessarily support nor negate the above view. These are Ericaceae, Leguminosae, and *Eriogonum* pollen. The first two categories are entomophilous while *Eriogonum* is also anemophilous (Martin 1963:73-74). All three categories are well represented in the Idaho flora today (Davis 1952), and occupy both dry and moist habitats. It should be pointed out that the Leguminosae pollen occurs in the same level as the *Yucca*-type pollen. As previously mentioned all of the cave pollen samples contained cultural debris (Table 1). Thus, it is possible that certain representations in the pollen records could reflect cultural use of subsistence plants. Numerous members of the Leguminosae can be used as potherbs and many produce edible seeds and roots. Yucca produces edible buds, flowers, fruits, seeds, and useful fiber (Kirk 1970:279). Since both Leguminosae and Liliaceae species are entomophilous, with limited pollen dispersal, cultural introduction of plant parts into the cave is a distinct possibility for both the *Yucca*-type and Leguminosae pollen occurrences. Rather than detracting from the environmental significance of the data, this simply emphasizes the probability that the early cave occupants were exploiting a different resource habitat than is accessible today. It is possible that a highly useful plant such as Yucca could have been transported into the site from some distance. Thus, it is not clear if the occupants were exploiting an intermountain island habitat rather than a basal plain or valley further from the site. This is particularly true since, as Davis pointed out (1952:4) floristic composition between mountain parks or islands and basal plains tends to be similar. However, considering the southern exposure of the cave and the present day distinction between north- and south-facing slope vegetation, it is possible that semi-desert flora grew on the south-facing canyon wall quite close to the cave itself.

The spore frequencies in the cave deposit exhibit a definite pattern. Frequencies of Selaginella densa spores are high almost throughout the entire cultural deposit, but decline sharply in the upper samples. This species grows on dry rocky soils, cliffs and talus (Davis 1952:59). Possibly the mosses recorded growing outside the cave entrance today are Selaginella densa (little club moss). The species has a prostrate growth habit and the microspores tend to drop immediately beneath the plants (Wilson and Loomis 1967:539). Given this attribute, it is difficult to explain the abundance of microspores in the cultural deposits in terms of natural occurrence. It is feasible to suggest that Selaginella densa, because of its densely

P.S.	Inclusions	Aggregates	Estimated number of grains observed in scanning
0-10	bone, shell, debitage, Douglas fir needles	L.P.-3a,Gr-2a	2250
10-20	bone, shell, debitage	L.P.-3a,S.P.-3a	180
20-30	bone, debitage	---	1800
30-40	bone, debitage	---	585
40-50	bone, shell, debitage	---	6300
50-60	bone, shell, debitage	S.P.-15a	4500
60-70	bone, shell, debitage	(S.P.-3b),Artem-3a	1485
70-80	shell, debitage	---	450
80-90	shell, debitage	S.P.-3a(4),Artem-4a	8100
90-100	debitage	S.P.-5a	450

Table 1. Test Pit 2 pollen aggregates and inclusions.

Artem - Artemisia
Gr Gr - Gramineae
L.P. - Large Pinus
S.P. - Small Pinus
● - frequencies of less than 1% (Figure 1)

cespitose form could have been brought into the cave as a bedding material. The decline in frequencies in the Upper, Shoshonean levels suggests that these later people did not follow this practice of the earlier occupants. The Dryopteris values in the deeper samples are probably suppressed relative to the club moss abundance, which accounts for the apparent Dryopteris increase in the upper samples.

In summary then, the Big Creek Cave pollen records suggest environmental differences through time. The predominant regional plant community was probably lower montane coniferous forest throughout occupation. However, during the end of the altithermal, the forest was apparently not as extensive as in post-altithermal times. This is evidenced by the lower values of pine, scarcity of Douglas fir pollen, and higher NAP values in the deeper cave samples. Juniper was possibly also more common during the warmer, drier times. Certain categories such as the Rosaceae were evidently unaffected by the change. The major distinction of the early samples was the apparent existence of semi-desert edapho-climatic communities in the region in the past, with such elements as greasewood, joint-fir and probably yucca. Thus, it is clear that the original inhabitants of the cave had access to resource zones which are different from those available today.

42SV981

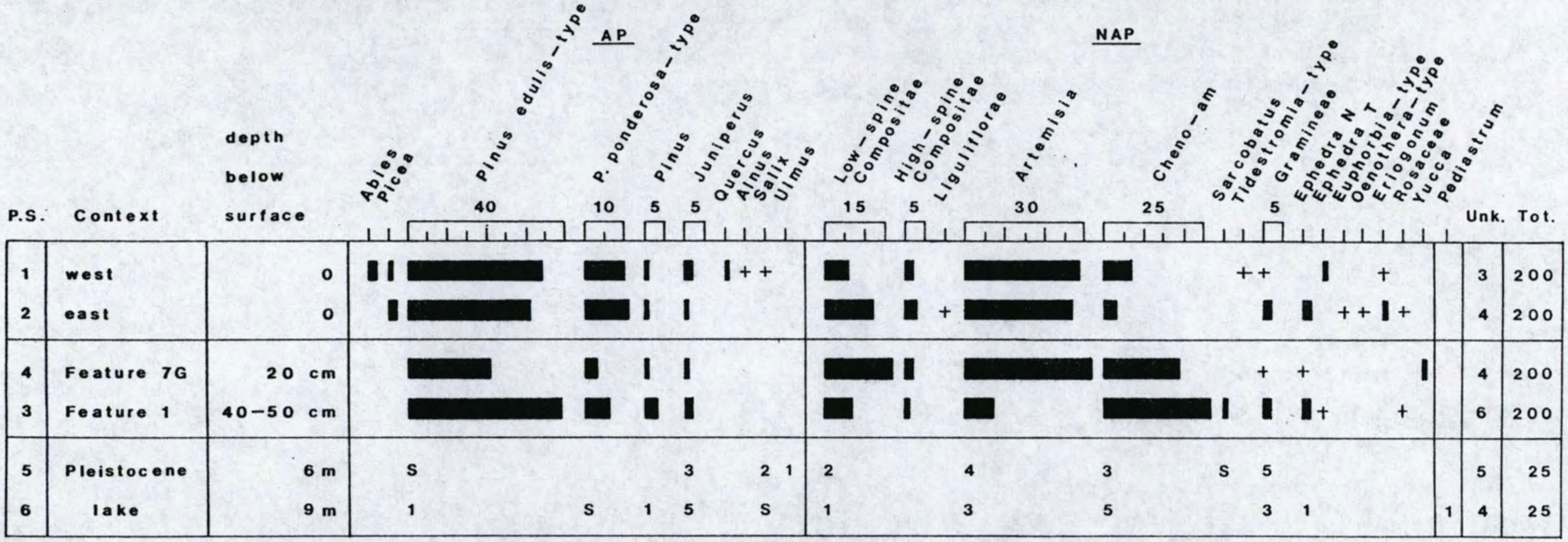
Site 42SV981 or the Alpha Omega site is situated south of Paradise Valley Lake in Paradise Valley. The lake is a playa with no associated riparian flora. Soils along the lake are quite saline. The predominant plant community on the valley floor is a sagebrush grassland with Artemisia tridentata (big sagebrush , a shrub species), Atriplex confertifolia (shadscale saltbush), Chrysothamnus nauseosus (rubber rabbitbush), Sarcobatus vermiculatus (black greasewood), Yucca glauca (small soapweed), and various composites and grasses. Forbs in the Paradise Valley area include members of the Geraniaceae, Polemoniaceae, Ranunculaceae, Umbelliferae, Leguminosae, and Solanaceae families. The hills surrounding the valley are covered by pinyon-juniper woodland. The site itself is in a transitional situation at the edge of a rocky basalt ridge leading into the valley, and is characterized by sagebrush, rabbitbush, and scattered pinyon and juniper. A stand of Populus tremuloides (aspen) occurs further south of the site but still in the valley. This southern end is moist with several seeps and a small stream fed by a spring (Birch Spring). Cleome (beeweed) is abundant here. Riparian plants include willows and birches. Ponderosa pine, Symphoricarpos utahensis (Utah snowberry), Ribes sp. (gooseberry), Ephedra viridis (green joint fir), Cercocarpus montanus (true mountain mahogany), Mahonia repens (Oregon grape), Purshia tridentata (antelope bitterbrush), and scattered oak are found north of the site in an area of sandstone outcrops and very sandy soils.

Site 42SV981 encompasses a wide area of several hundred meters and includes a number of rock shelters and structures and numerous fire pits, basalt rings, and hearths. Ceramics and a great abundance of lithic materials are found in the area. The depth of cultural debris extends to $2\frac{1}{2}$m in some locations. The site was repeatedly used through the centuries as a camp and habitation site by several cultures and includes Archaic, Fremont, Paiute/Ute and Shoshonean components.

The preliminary pollen study of the site involved six pollen samples. Two of these were surface pinch samples. Sample 1 was collected from the northwest part of the large site area in the sagebrush-grassland community, and sample 2 from the northeast part of the site towards the sandstone outcrops in sagebrush grassland with joint fir and a few ponderosa pine. The distance between the two sampling locations was about 75m. Two samples were collected from some of the late cultural horizons. Sample 3 was collected near Feature 1, a hearth, and sample 4 near Feature 7G another hearth. In neither case was the actual hearth fill sampled, since environmental information was being sought, not ethnobotanic. Feature 1 was a cobble-lined Shoshonean hearth which exhibited multiple periods of use. Charcoal within the hearth dated to about 540 ± 50 B.P. Feature 7G was about 70m uphill from Feature 1 and was transected by a gulch which cuts through the site. Several fires had been built in this hearth but the period of use was fairly short. It contained fire-cracked rock, was Shoshonean, and dated to around 200-300 B.P. Samples 5 and 6 were collected in a column in deeper deposits from the same gulch where Feature 7G was found, only about 50m further northeast along the gulch. These samples represent deposits from a substantial lake which once existed in Pleistocene and early post-Pleistocene times. Sample 6 was collected from lake bottom clay sediments about 9m (30 feet) below the present ground surface, and sample 5 from later beach sands about 6m (20 feet) below the present ground surface.

Four of the pollen samples produced 200 grain counts. Pollen densities were low in the Pleistocene lake samples and preservation was poor. Counts of 25 grains were obtained, and because of these low pollen sums are presented as numbers observed in Figure 3 rather than frequencies. Categories listed as "S" were observed in scanning.

The two surface pollen records are very similar. In the AP, the proximity of pinyon-juniper woodland is reflected by high pinyon values (note aggregates, Table 2). The prolific production of pine pollen apparently overwhelmed the potential juniper influence. Sources for the spruce and fir pollen representations probably occur less than 2-3 miles west and northwest of the site where elevations exceed 9000 feet. The remaining AP representations are probably local. Alnus (alder) was not recorded in the flora list, but possibly occurs in the southern end of the valley where other riparian arboreals were observed. Frequencies of the major NAP categories were also similar between the two surface samples. There is a difference in the variety of pollen categories recorded. However the distinctions are not strongly diagnostic. In summary, there are no outstanding differences between the east and west surface samples. Both records suggest a pinyon-juniper woodland



AP
NAP
P.S.
Context
depth
below
surface
Abies
Picea
Pinus edulis-type
P. ponderosa-type
Pinus
Juniperus
Quercus
Alnus
Salix
Ulmus
Low-spine Compositae
High-spine Compositae
Liguliflorae
Artemisia
Cheno-am
Sarcobatus
Tidestromia-type
Gramineae
Ephedra N
Ephedra T
Euphorbia-type
Oenothera-type
Eriogonum
Rosaceae
Yucca
Pediastrum
Unk.
Tot.
40
10
5
5
15
5
30
25
5
1 west 0
2 east 0
4 Feature 7G 20 cm
3 Feature 1 40-50 cm
5 Pleistocene 6 m
6 lake 9 m
3 200
4 200
4 200
6 200
5 25
1 4 25
S 3 2 1 2 4 3 S 5
1 S 1 5 S 1 3 5 3 1

situation with a sagebrush understory. Thus, the transitional situation and the proximity of the open grassland are not well reflected.

The pollen records from the two feature areas, 7G and 1, exhibit some obvious differences from the surface samples. The major difference is the consistently higher Cheno-am influence in the subsurface deposits. Paradise Valley has been subjected to heavy livestock grazing in historic times. Many chenopodiaceous components of grassland are palatable to livestock, and probably a depletion of chenopodiaceous plants through overgrazing is reflected by the surface samples. Thus, the high subsurface Cheno-am values are considered to be natural and not indicative of habitat disturbance or cultural use of chenopodiaceous species. A smaller variety of categories is also seen in the subsurface samples in comparison to the surface samples, but this is a common normal factor of pollen preservation and decay.

Distinctions between the two subsurface samples are also apparent. In the AP, pinyon is the most strongly represented category in both samples, but the value is not as high in sample 4. This corresponds to higher Compositae and Cheno-am values. In sample 3, Compositae values are much lower with a corresponding higher frequency of pinyon pollen. The contrast probably reflects local variability in abundances of shrub and herb species, with a lighter density of ground cover at the Feature 1 location. No regional differences by time are inferred. Yucca pollen was recorded in sample 4. Yucca produces many edible plant parts (Kirk 1970:179). However, considering the contexts of the samples and the fact that yucca grows in the area today, no cultural use is inferred.

In summary, the pollen rain from both locations appears natural. The higher Cheno-am values suggest a grassland situation. The presence of Sarcobatus pollen in sample 3 supports this since greasewood is a common component of grassland. As previously mentioned, even though Sarcobatus is wind-pollinated, pollen presence tends to correlate well with plant presence (Gish 1979:15). In both subsurface samples, however, the influence of the nearby pinyon-juniper woodland community is also strongly apparent through the relatively high pinyon values. Thus, a fairly transitional condition is reflected which is consistent with the modern situation of the site in sagebrush-grassland, but at the edge of a ridge covered by pinyon-juniper woodland. In conclusion then, there are no major environmental differences between the two periods of subsurface occupation. The differences between the modern and earlier periods probably relate to effects of historic land use rather than any major environmental shifts. These effects apparently involved abundances of particular plants rather than floristic variety.

The two samples from the Pleistocene lake share a number of pollen categories with the later samples but also reveal some distinctly different characteristics. Although the counts are low, one of the more notable attributes is the consistent presence of Salix pollen. Ulmus (elm) pollen was also found in one of the samples. Ulmus does not grow naturally this far west today. However, Ulmus has been found in other Pleistocene deposits in the southwest (Martin 1963:37, 40), usually in

P.S.	Additional categories observed in scanning	Aggregates	Estimated number of grains observed
1	Pseudotsuga, Eph N	P.ed-4a, Artem-10a	8100
2	Pseudotsuga	Picea-2a, P.ed-10a, Low-10a Artem-3a(6), Gr-2a	5175
4		Low-6b, Artem-4b(15), Ch-2a	3375
3		Ch-3b	1575

Table 2. Pollen aggregates at 42SV981.

a - 1   d -15
b - 5   e -25
c -10   f -50

Artem - Artemisia
Ch - Cheno-am
Ephedra N - Ephedra nevadensis-type
Ephedra T - Ephedra torreyana-type
Gr - Gramineae
Low - Low-spine Compositae
P.ed - Pinus edulis-type
S - Scanning
+ - less than 1%

conjunction with other riparian arboreals. It seems feasible to suggest that both the Ulmus and Salix pollen reflect growth of riparian arboreals along the lake during Pleistocen times. One non-polliniferous microfossil of Pediastrum (colonial green algae) was also observed. Abundances of Pediastrum can indicate a large, permanent water source (Halfsten 1961:88). Although the Pediastrum is not abundant, the occurrence is consistent with the geologic evidence for a substantial lake at this location during Pleistocene and early post-Pleistocene times. The predominant regional plant community in the valley during this time cannot be reliably inferred at present due to the low pollen sums.

In summary, the pollen results from 42SV981 suggest significant environmental changes through time. In Pleistocene and early post-Pleistocene times Paradise Lake was apparently quite substantial. Considering the difference in depth between the two lake samples, riparian flora probably characterized the lake shore for an extensive period of time. The other two subsurface samples reflect a much later period. Differences between the Feature 1 and 7G locations are demonstrated in terms of floristic abundances. Differences involving floristic abundances are also in evidence between the subsurface samples and surface records.

Conclusions and Recommendations

The major objectives of both the Big Creek Cave study in Idaho and the analysis of 42SV981 contexts were an evaluation of pollen research potential and a preliminary interpretation of environment. Both sites produced results which prove that future research should be very rewarding. Although the total number of samples studied was small, environmental changes through time are clearly documented at both sites. At Big Creek Cave the pollen record is compressed with 1m of material representing 4000 years of deposits. Sampling at 10cm intervals is fairly coarse for this type of deposit, and has contributed to the somewhat erratic nature of the pollen results. Future sampling at narrower intervals of 5cm would provide a better understanding of the onset of changes and probably would aid time control. Pre-occupation sterile samples and modern surface control samples outside the cave would both contribute to a better environmental perspective. At 42SV981, the potentials for future research are broad. A complete pollen column in the gulch from which samples 4 and 5 were collected could provide a good regional perspective of environmental change through time. Considering the depth of the material, 10cm intervals would probably be appropriate. In terms of feature sampling, with such a large multi-component site of mostly ephemeral features and artifact scatters, it would perhaps be advisable to concentrate on consistently sampling particular feature types. Datable hearths and fire pits with control samples from associated original ground surfaces would provide both environmental and ethnobotanic information.

Bibliography

Butler, Robert B.
1978 A Guide to Understanding Idaho Archaeology: the Upper Snake and Salmon River Country (3rd edition). Idaho State University Museum, Pocatello.

Cronquist, Arthur, Arthur H. Holmgren, Noel H. Holmgren and James L. Reveal
1972 Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A., Vol. 1. Hafner Publishing Co., New York.

Davis, Ray J.
1952 Flora of Idaho. Brigham Young University Press, Provo.

Elmore, Francis H.
1976 Shrubs and Trees of the Southwest Uplands. Southwest Parks and Monuments Association, Globe.

Gish, Jannifer W.
1978 McGaffey #1, an intensive palynological study. MS. Quaternary Palynology Research Facility, Mesa. Report to the USDA Forest Service, Southwest Region, Albuquerque.

1979 Palynological results of the Coronado Project. MS. Quaternary Palynology Research Facility, Mesa. Report to the Museum of Northern Arizona, Flagstaff.

Halfsten, Ulf
1961 Pleistocene development of vegetation and climate in the Southern High Plains as evidenced by pollen analysis. In Paleoecology of the Llano Estacado, edited by Fred Wendorf. Fort Burgwin Research Center, Publication 1:59-91.

Harrington, H.D.
1967 Edible Native Plants of the Rocky Mountains. The University of New Mexico Press, Albuquerque.

Kearney, Thomas H., Robert H. Peebles, and collaborators
1960 Arizona Flora. University of California Press, Berkeley.

Kirk, Donald R.
1970 Wild Edible Plants of the Western United States. Naturegraph Publishers, Healdsburg.

Martin, Paul S.
1963 The Last 10,000 Years, A Fossil Pollen Record of the American Southwest. The University of Arizona Press, Tucson.

Scott, Linda J.
1978 Analysis of pollen from sites 5MF480 and 5MF607, Moffat County, Colorado. MS. Palynological Analysts, Montrose.

Shelford, Victor E.
1974 The Ecology of North America. University of Illinois Press, Urbana.

Swain, Albert M.
1973 A history of fire and vegetation in Northeastern Minnesota as recorded in lake sediments. Quaternary Research 3:383-396.

Webber, John M.
1953 Yuccas of the Southwest. U.S. Department of Agriculture, Agriculture Monograph 17.

Wells, Philip V.
1970 Vegetational history of the Great Plains: a post-glacial record of coniferous woodland in southeastern Wyoming. In Pleistocene and Recent Environments of the Central Great Plains, edited by Wakefield Dort, Jr. and J. Knox Jones, Jr., pp. 185-202.

Wilson, Carl L. and Walter E. Loomis
1967 Botany (4th edition). Holt, Rinehart and Winston, New York.

Wylie, Jerry, Tom Scott, and Joe Gallagher
1981 Test excavations in the River of No Return Wilderness: preliminary report on Waterfall Village and Big Creek Cave. MS. USDA Forest Service, Intermountain Region, Ogden.