

AN ARCHAEOLOGICAL RECONNAISSANCE OF THE OVER-THE-HORIZON
RADAR PROJECT TRANSMITTER SITE, BUFFALO FLAT,
CHRISTMAS LAKE VALLEY, LAKE COUNTY, OREGON

by

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Report Submitted to the
U.S. Army Corps of Engineers, Seattle District
in partial fulfillment of the conditions and specifications of
Contract No. DACA 67-85-D-0033
Work Order No. 7

The technical findings and conclusions in this report do
not necessarily reflect the views or concurrence of the
sponsoring agency.

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April 1986

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site locations will not be distributed publicly.

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ABSTRACT

During the second week of October, 1985 an intensive pedestrian archaeological reconnaissance of approximately 1700 acres was conducted on Buffalo Flat, Christmas Lake Valley, Lake County, Oregon. The project was prompted by the proposed development of the Over-the-Horizon Radar Project transmitter site. The purpose of the reconnaissance was to provide the Seattle District, U.S. Army Corps of Engineers information regarding the number, nature, and location of cultural resource sites in the project area so that preliminary management decisions would be enabled.

The reconnaissance identified 36 prehistoric cultural resource sites. Evidence from these sites provides for a distinction between lithic scatters, plant processing sites and fire-cracked rock/groundstone assemblages. Stylistic analysis of collected projectile points suggests the area was used, perhaps intermittently, throughout the Holocene but more intensively during the last 2000 years.

Because the sites have potential for contributing to our understanding of the subsistence/settlement systems operant during the mid-to-late Holocene in the Fort Rock Basin, further investigation at the sites is deemed appropriate.

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ACKNOWLEDGEMENTS

A number of people have contributed to the completion of this project. I owe considerable thanks to Mr. Guy F. Moura whose assistance in the field was, as usual, invaluable. Mr. Moura directed the Reconnaissance and prepared Figure 7. Mr. Robert Dello-Russo conducted the instrument survey and prepared Figure 3. Mr. Larry Bullis photographed the artifacts.

Special thanks are extended to the Seattle District, U.S. Army Corps of Engineers who sponsored this project. Specifically I wish to thank Messrs. Lawr Salo and David Munsell, archaeologists, for their support and helpful direction in the completion of both fieldwork and report preparation.

Finally, I would like to extend my gratitude to the friendly people of Evans-Hamilton, Inc., Seattle. Mr. Jeff Cox negotiated the contract and reviewed this document. Mr. Keith Kurrus and Ms. Carol Coomes drafted the figures and Ms. Cindy Word assisted in the preparation of the maps. Ms. Susie Ebbesmeyer and Ms. Toni Proctor typed the draft and final reports, and Ms. Shanon Hawes assisted in the preparation of the report.

INTRODUCTION

The Seattle District, U.S. Army Corps of Engineers (the Corps) is assisting the U.S. Air Force in a cultural resource impact study for the Over-the-Horizon Project transmitter site in Christmas Lake Valley, Lake County, Oregon. As part of the study they required a cultural resource reconnaissance of several tracts associated with the project. A portion of the project area had been previously subjected to an archaeological reconnaissance resulting in the documentation of 20 prehistoric cultural resource sites spanning the last 6000 years (Toepel 1982). Archaeological investigations elsewhere in the region have documented human habitation for the last 13,000 years (Bedwell 1973). This extensive prehistoric use of the area, spanning the terminal Pleistocene and entire Holocene periods underscored the need for a cultural resource reconnaissance of the proposed project area.

On October 7, 1985, at the request of the Corps, Evans-Hamilton, Inc. initiated an archaeological reconnaissance of approximately 1700 acres on Buffalo Flat, Christmas Lake Valley, Oregon. The survey area included three overlapping rectangles and a linear access road minus a half-hexagon shaped parcel previously surveyed by Toepel (1982) (see Figures 1 and 2).

As outlined in the statement of work the goals of this project were to:

- a. Inventory the cultural resources on project lands for planning purposes and to facilitate transfer of the lands from the Bureau of Land Management to the U.S. Air Force;
- b. record all exposed prehistoric and historic cultural resources in project impact areas;
- c. identify needs for additional cultural resource work in the area.

As a result of archaeological investigations in the project area, 36 prehistoric cultural resource sites were recorded in the project area. This report presents a description and results of the project.

ENVIRONMENTAL OVERVIEW

Project Location

This project was located in the Buffalo Flat area of Christmas Lake Valley, the eastern-most division of Fort Rock Basin, a Pleistocene Lake Basin in South Central Oregon. Situated approximately 18 miles east of the settlement of Christmas Lake Valley, Lake County Oregon, the project area is located on the valley floor between elevations of 4300 and 4315 feet above mean sea level (Fig. 1). The terrain here is a treeless shrub-dominated plain with occasional low remnant dunes. To the north, at the periphery of the project area, are found more pronounced dunes rising some 20 feet off the valley floor. No permanent streams, ponds, or springs are found in the Buffalo Flat area.

Geomorphology

The reconnaissance area is located in the transition zone between the High Lava Plains and the Basin and Range provinces. This area is known for its north trending fault block mountains which enclose large basins. The Fort Rock basin is a pluvial lake basin that encompasses Christmas Lake Valley, Fort Rock Valley, and Silver Lake Valley. During the Pleistocene period most of the basin was covered by a large body of water known as pluvial Fort Rock Lake. Bedwell (1973) has suggested that the level of the Lake was between 4386 and 4391 feet approximately 13,000 years ago. As a result of a significant warming trend around 10,000 years ago, the Lake began to recede; several thousand years later, only Silver Lake and Paulina marsh in the southwest portion of Fort Rock Basin remain.

As discussed later in this report, an understanding of prehistoric settlement patterns in the basin will necessitate the reconstruction of mid-to-late Holocene lake levels. One interesting problem will be the degree to which post-Pleistocene uplift (both isostatic and tectonic) obscures the tracing relic lake shores from one part of the basin to another.

All drainage into the basin is internal. Numerous stream beds have cut into the uplands around the basin and empty into it. Most of these are dry throughout the greater part of the year.

Bedrock Geology and Soils

Rocks ranging in age from Pliocene through Recent (Holocene) epochs are found in the Buffalo Flat area. The oldest exposed rock unit is the Picture Rock Basalt which is comprised of basaltic lava flows and interbedded pyroclastic material. Overlying this is the Fort Rock Formation, the

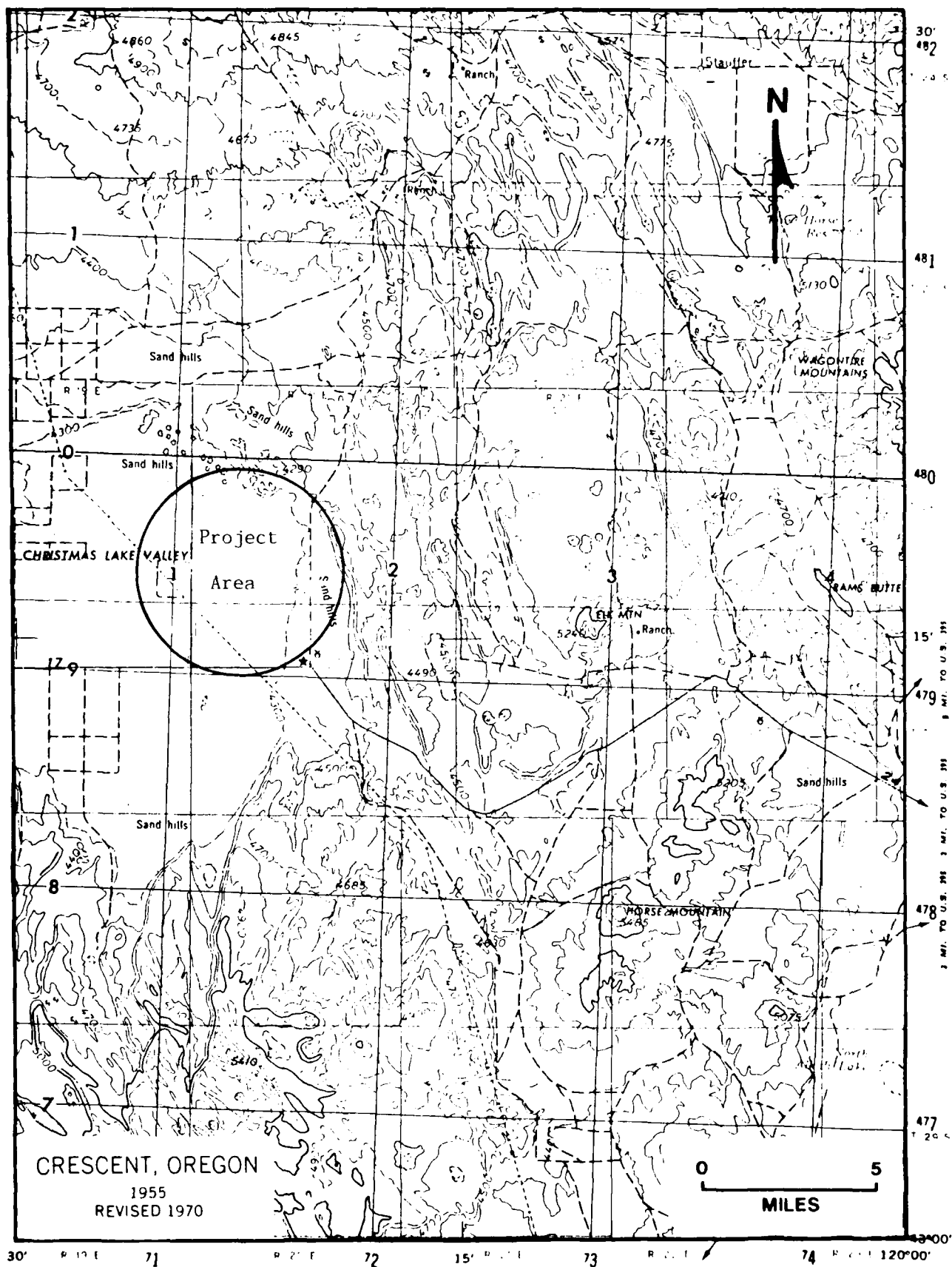


Figure 1. Project area.

primary rock unit representing the Christmas Lake Valley geology. It is a sequence of volcanic and sedimentary materials, typically unconsolidated and semi-consolidated lacustrine clay, silt, sand and gravel, irregularly overlying the Picture Rock Basalt and volcanic rocks of intermediate composition. The Fort Rock formation is comprised of four rock types: tuff, diatomite, basaltic agglomerate, and basaltic lava, in descending order of abundance (Hampton 1964).

The Buffalo Flat area is dominated by the Flagstaff soil series which consist of poorly drained silt loams over silty clay loam, sodic soils underlain by hardpan (USAF 1983).

Typically, the surface layer is a light grey silt loam about three inches thick. The sub-soil is light grey, light brownish grey, and very pale brown silty clay loam about 11 inches thick. A weakly to strongly cemented hardpan occurs at a depth of about 14 inches. Because of poor drainage, shallow spring flooding of these salt affected soils occurs periodically. The flat terrain results in very slow runoff and little water erosion.

Flora

As discussed by Minor et al. (1979) and Toepel (1982) two principal vegetation zones are present in the Buffalo Flat area. These are the shrub-steppe zone and the desert shrub zone.

Occupying the arid areas of the lower elevations in this region, the shrub-steppe zone is dominated by conspicuous shrub layers, particularly sagebrush species, with an understory of grasses. Minor et al. (1979:19) describe the constituents of this zone:

Shrubs which sometimes occur with the sagebrush include Chrysothamnus (rabbit brush), Ribes cereum (wax current), and Symphoricarpos rotundifolius (round leaved snowberry). Juniperis occidentalis occurs on rimrock habitats, intermittent drainages, and the moister slopes. The grass most commonly associated with the zone ... is Poa sandbergii (Sandberg's blue grass); other associated grasses include Agropyron spicatum (blue bunch wheat grass), Festuca idahoensis (Idaho fescue) and Elymus cinereus (giant wildrye). A variety of perennial and annual herbs also occur in this zone.

The desert shrub zone, a drought tolerant vegetation, is found on the highly alkaline and saline hardpan flats of the valley floor. Franklin and Dyrness describe this zone (1973:245).

Important shrubs in these communities can include Grayia sponoza (spring hopsage), Atriplex confertifolia (shadscale), A. nuttali (Nuttall's saltbrush), Eurotia

lanata (winterfat), Artemisia spinesuns (bud sagebrush), and Sarcobatus vermiculatus (black greasewood). Grasses sometimes associated with these shrubs include Elymus cinerus (grant wildrye), E. triticoides (creeping wildrye; which may dominate on ancient lakebeds), and Distichlis stricta (alkali saltgrass).

A brief paleo-environmental overview which discusses postulated sequences of environmental change through the Holocene is presented by Minor et al. (1979). A summary of the major climatic changes following the Pleistocene is provided by Bedwell (1973:43).

Some years ago, Kirk Bryan, Ernst Antevs, and others formulated a hypothesis of climatic change which came to be called the "alluvial chronology." They suggested that cool, glacial climates gradually gave way to warmer conditions over the years until a period was reached in which mean annual temperatures exceeded those of today. This temperature gradually declined until the mean annual temperatures reached today's range. Antevs (1948) proposed the name, Neothermal, i.e., new or recent thermal, for the whole period. He divided the Neothermal into stages: the Anathermal (cooler than today), the Altithermal (hotter than today), and the Medithermal (temperatures approximately like the present), dating these periods: from 10,000 to 7,500 years ago for the Anathermal, from 7,500 to 4,500 years ago for the Altithermal, and from 4,500 years ago to the present for the Medithermal. Antevs refined the concept in various publications, and the hypothesis became an important postulate in the study of Great Basin archaeology and archaeology in general.

The reader is referred to the above documents for further detail.

Fauna

Very little wildlife is now found in the project area. The limited variety of plant life and lack of topographic diversity is reflected in the restricted numbers and kinds of animals that use the area.

Resident mammals include species typical of south-central Oregon shrub-steppe habitats: coyote, bobcat, badger, black-tailed jackrabbit, and small rodents such as the least chipmunk, Ord's kangaroo rat and the deer mouse.

Only a few species of birds breed in the shrub habitats in the study area: Brewer's sparrow, sage sparrow, horned lark, and sage thrasher. Seasonal visitors might include northern shrikes, grey-crowned rosy finches and Lapland longspurs.

CULTURAL OVERVIEW

Archaeology

The Fort Rock Basin has been the focus of a number of archaeological inquiries spanning the last 50 years. Considerable attention has been paid to the cultural resources in this area, no doubt due to the history of human occupation over the last 13,000 years. Since adequate summaries of the archaeological research in the Fort Rock Basin are already available (Minor et al. 1979) this section will focus only on previous work that is immediately relevant to the Buffalo Flat area of Christmas Lake Valley.

Early archaeological studies in the Fort Rock Basin have focused on hunter-gatherer adaptations to late-Pleistocene and early/mid-Holocene environments (Bedwell 1973). While diachronic in nature these inquiries are oriented more toward the reconstruction of Paleo-Indian and early Holocene lifeways than those which followed, generally ignoring human settlement after 3000 years B.P. This peculiar constraint is no doubt a function of a research focus stemming from the exceptional time depth of human occupation in the area and its manifestation in archaeological sites. More recent studies conducted under the auspices of cultural resource management have been oriented toward the recording and evaluation of archaeological sites without regard to their age. In the eastern portion of Fort Rock Basin, specifically Christmas Lake Valley, these endeavors have indicated human habitation for perhaps the last 10,000 years (Toepel 1982).

Since 1976 several cultural resource studies have been conducted in the western area of the Fort Rock Basin. In reports of cultural resource reconnaissance of parcels near the study area Toepel (1980, 1982) discusses the previously recorded sites and presents a preliminary functional classification of the reported sites which distinguishes between open lithic scatters, plant processing sites, and quarries (Table 1).

Lithic scatters consist primarily of concentrations of debitage or waste flakes, although tools such as knives and projectile points are also occasionally present. They represent 78% of the sites reported in the area and are most common at elevations above the valley floor in association with the juniper woodland/shrub-steppe biotic communities (Toepel 1982). These sites reflect the remains of chipping stations or small hunting camps.

Plant processing sites, which represent 15% of the sites recorded, are characterized in this scheme as extensive lithic scatters marked by the additional presence of groundstone tools. Most of these sites were restricted to the dune environment of the valley floor, and in all cases they were associated with

Table 1. Cultural Resource Site Classification (after Toepel 1982).

Site Class	Manifestation	Location	Associated Biota Zones
Lithic Scatter	Concentration of lithic debitage and occasionally projectile points, knives or other tools	most common above valley floor	juniper woodland/ shrub-steppe
Plant-processing sites	extensive lithic scatters and groundstone tools	most common in dunes of valley floor	shrub-steppe or desert shrub
Quarry Sites	Lithic debitage and raw lithic material in the form of outcroppings or nodules	locations relate directly to presence of raw material	not applicable

either shrub-steppe or desert shrub biotic communities. These sites were occupied by a greater number of people and/or for longer periods of time than the lithic scatters, perhaps as seasonal camps or villages.

Quarry sites, the final site type, constituted 7% of the sites recorded and are localities where raw lithic material in the form of outcroppings or nodules was obtained by aboriginal people for use in stone tool manufacture. Quarry locations relate directly to the presence of lithic materials and are generally larger in areal extent than lithic scatters and plant processing sites.

Applying this classification to sites recorded in an area immediately adjacent to our project area, Toepel reported six open lithic scatters and 14 plant processing sites which reflect the use of the area over the last 6,000 years. She noted that this number of sites suggests rather intensive use of the area, which is surprising given the fairly hostile environment, and concluded that the prehistoric occupation reflected by the sites was during times when the environment was more favorable than it is today.

Ethnography

Since an entirely adequate ethnographic overview for the project area has been presented by Toepel (1982) only a brief summary extracted from that report will be presented here. The project area, as well as all of Christmas Lake Valley, is located within the historically documented territory of the Numic speaking Yahuskin band of the Northern Paiute people (Stewart 1938; Toepel 1982). These people were semi-sedentary, settling in small villages near major reliable water sources in the winter and moving about frequently to harvest root and seed crops during the remainder of the year. They visited the uplands in search of game, roots, seeds and berries, as well as taking advantage of the fish, game and plant foods to be found in and along the streams and rivers in the lower elevations (Toepel 1982:11).

No specific reference is made to Christmas Lake Valley in the ethnographic literature, and the ethnographic distribution maps mark the valley as "unoccupied". The dearth of aboriginal settlement during the historic period is attributable, Toepel surmises, to the absence of reliable water sources on the valley floor. It is interesting to note that although the valley floor was not intensively used during the historic period the archaeological data suggest recurring activity for the last several millenia.

History

Like the historically documented Native American use of the Christmas Lake Valley, the Euro-America habitation here has been very sparse. The initial white occupation of Christmas Lake Valley followed the opening of newly discovered gold mining districts in eastern Oregon in the latter part of the nineteenth century. A number of unsuccessful attempts at settling and raising cattle in the valley occurred during the 1870's and 1880's, but economic and environmental pressures eliminated most of these before 1900.

There is little indication from the historical archaeological record of historic settlement in the project area. Some historic use is indicated by the remains of a homestead located immediately to the west of the project area in the east portion of Section 25. Also there are reports that a post office was at one time located at Buffalo Wells, testifying to some historic use of the surrounding area. The harsh environmental features here have probably precluded much use of the project area. The old lake bed is too saline for farming and has very little forage for stock grazing (Toepel 1982).

METHODS

The archaeological reconnaissance of the Over-the-Horizon Radar Project transmitter site consisted of a systematic pedestrian inspection of approximately 1700 acres of Pleistocene lake bed. The purpose of the reconnaissance was to record the location and condition of cultural resources in the project area. Given the intensity of the field coverage, the relative absence of ground cover and the limited biases, we anticipate that the reconnaissance resulted in an accurate inventory of cultural resources in the survey area and that few sites could be anticipated other than those found.

As presented in the statement of work the survey minimally required us to:

1. Systematically examine the exposed soil surfaces and record locations of resources as well as survey transects. Sequence of areas examined may be based on tactical considerations such as weather access, etc. Parallel transects, not to exceed 60 meters apart, would be used as the general technique for systematically examining the project. Alternate techniques would be employed to satisfy this requirement with the consent of the authorized representative of the contracting officer (ARCO);
2. record observations on geomorphological variability, site condition, erosion factors and previous and potential project impacts;
3. in addition to recording surveyed areas and sites located on project maps and aerial photographs, complete a site survey form provided by the Seattle District for all sites identified;
4. collect all temporally diagnostic prehistoric artifacts with careful documentation of their provenience;
5. photograph all sites in color and black and white, including detail of stratigraphy, erosion or other pertinent features.

The major obstacle to implementing the cultural resource reconnaissance as outlined above was in locating the project boundaries given the general absence of landmarks on the valley floor. Previous projects have experienced this problem with resulting difficulty in correlating the location of cultural resource sites with the project area (Toepel 1982). To rectify this situation we employed a professional land surveyor and state of the art surveying equipment (a Leitz theodolite transit and electronic distance meter). This enabled us to establish, with reasonable certainty, the "on the ground" project

boundaries. A potential source of error, however, arose insofar as we were not provided with a legal description of the project area. Rather, we were required to use a USGS Quad map with the project boundaries outlined. Some estimation of distance from section corners for our "point of beginning" was necessary. Given these limitations we feel the reconnaissance was as accurate as possible and an improvement over the next best alternative, i.e., estimating the project location based on bearings on landmarks some distance from the survey area.

The property survey established four blocks (areas A, B, C, and D in Figure 2). This figure also presents the bearing and distances of all boundary lines as used in the project. The boundaries of each block were flagged at 100 meter intervals to enable the reconnaissance team to locate them.

The cultural resource reconnaissance was conducted using six team members spaced at 45 meter intervals (Fig. 3). Transect orientation was maintained with the use of hand-held compasses. Transects were flagged and numbered to maintain bearing integrity. Site location, geomorphological features, and isolated finds were documented according to Block number, transect number and distance from Block boundary as estimated by pacing.

The reconnaissance team members recorded observations in field notebooks. Archaeological sites, liberally defined as any concentration of ten or more items of cultural material within an area of ten meters or less in diameter (Toepel 1982:16), were recorded using forms provided by the Corps. Photographs were taken of all sites. Temporally diagnostic material both isolated and from sites was collected with careful documentation of provenience.

One source of confusion the reader may notice is in definition of certain cultural material documented in this reconnaissance. Fragmentary basalt objects have been described as groundstone during previous projects, but many of these appeared to us to be thermally altered or fire-cracked rock. Since the primary distinction between previously recorded site types (plant processing and lithic scatter) hinges on the occurrence of "groundstone", for the sake of consistency with previous projects we have documented the occurrence of this material as fire-cracked rock/groundstone. Only objects which exhibit discrete patterns of wear are described on the site records and in the text of this report as groundstone. Thus, the classification of sites remains basically consistent with previous projects in the area.

Items collected during this project have been subjected to analysis, the results of which are described in the Interpretation section. The collection has been deposited at the Oregon State Museum of Anthropology (Accession Lot 578) and is available for observation. Materials that have been previously collected from the project area have been deposited

Christmas Lake Valley Archaeological Reconnaissance

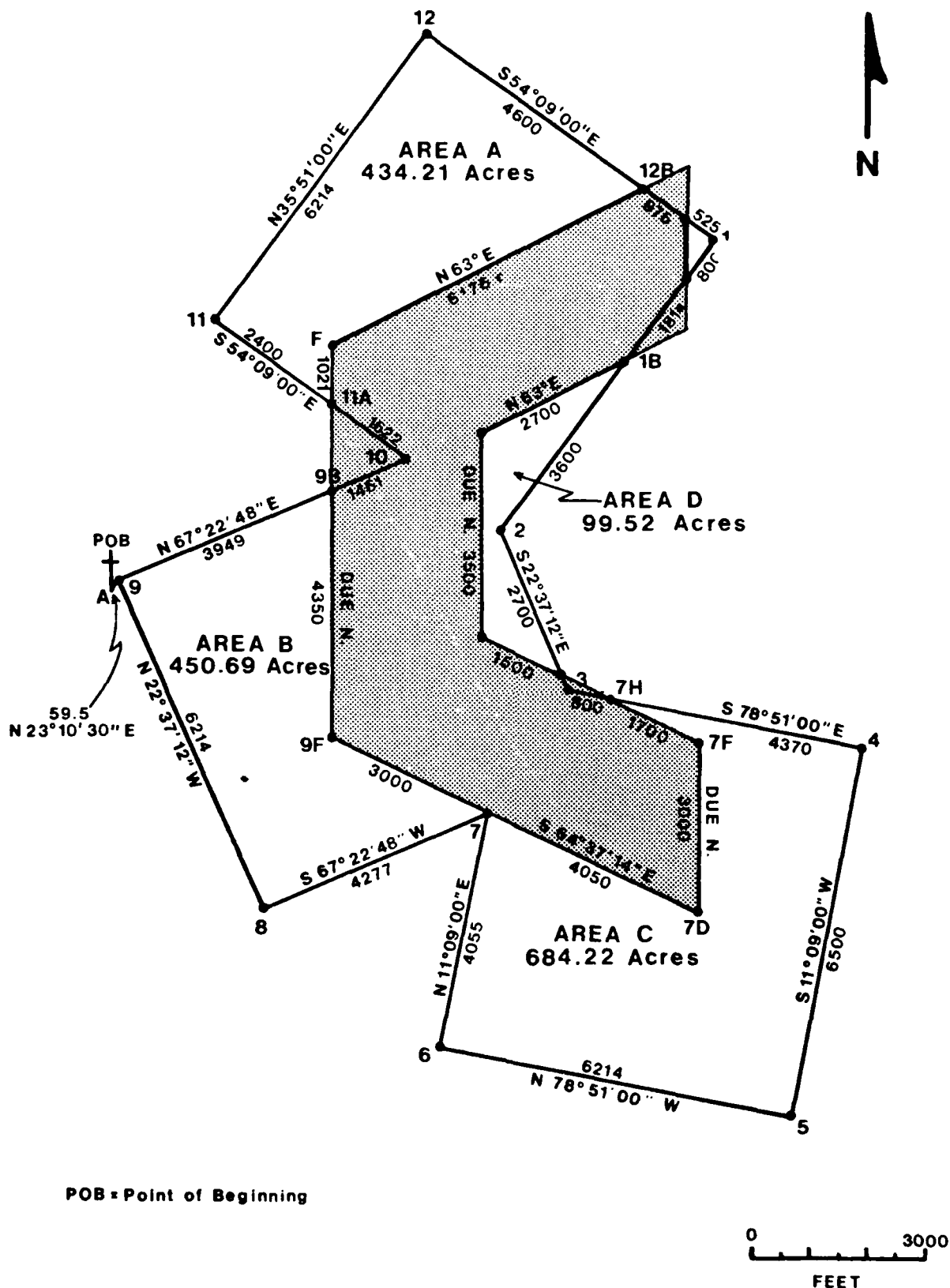


Figure 2. Project area as reconnoitered. Shaded area was previously surveyed by Toepel (1982).

Figure 3 has been deleted for public release of this document.

at the Oregon State Museum under accession lot 470.

Analysis was limited to projectile points, bifaces, and fragments thereof. The orientation of this analysis was the delineation of artifact attributes suitable for a chronological assignment of the object and inferentially the collection/component with which it is associated. This effort draws heavily on the work of Pettigrew (1985). He suggests the use of a number of attributes to discriminate between chronologically sensitive types (Figure 4) found at archaeological sites on the east shore of Lake Abert, Lake County, Oregon. Fundamental to this classification are the attributes; "stem ratio" and "basal indentation ratio" (BIR). Stem ratio is a function of neck width over the base width. BIR is a function of the length of the base over the length of the object. This classification generates 13 types which correspond to traditional Great Basin types. Postulated date ranges for projectile point types are presented in Table 2. A narrative description of projectile point styles previously presented by Pettigrew (1985) is found in Appendix A. The metric data for the project's collection are presented in Table 3.

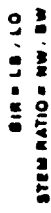


Figure 4. Projectile point classification presented as a dendrogram (after Pettigrew, 1985).

**Table 2. Great Basin Projectile Point Styles and Dates
(after Pettigrew 1985).**

Point Type	Designation	Date Range
Small Side Notched	SSN	AD 1200 - historic times
Unstemmed Triangular	UT	AD 900 - historic times
Rosegate A	RGA	AD 1 - contact
Rosegate B	RGB	AD 1 - contact
Rosegate C	RGC	AD 1 - contact
Elko-eared	EE	2000 BC - AD 1000
Elko-corner Notched	ECN	2000 BC - AD 1000
Gatecliff Split Stem	GSS	3000 BC - 500 BC
Gatecliff Contracting Stem	GCS	3000 BC - 500 BC
Willow Leaf	WL	-
Humboldt Concave Base	HCB	4000 BC - 1000 BC
Lanceolate Concave Base	LCB	9000 BC - 5000 BC
Large Side-Notched	LSN	5000 BC - 2000 BC

See Appendix A for type definitions.

Measurements in cm²

Units

Catalogue No.	Raw Material	Point Type	NW	BW	L	W	TH	Frag. Type	Comments
578-1	CCS	L (?)	-	-	3.8	2.0	.6	FM	Finely serrated
578-2	OBS	RGC	.5	.8	1.9	1.3	.3	C	
578-3	CCS	SN	1.5	2.3	4.0*	2.3*	.3	T	Fine oblique flaking & very thin tip missing
578-4	OBS	RG?	.5	-	1.7*	1.4*	.2	T, Sb, B	
578-5	CCS	WL	-	-	5.6*	2.3	.5	S	
578-7	OBS	WL	-	-	3.8*	2.0	.5	FM	
578-10	OBS	HCB	-	-	4.2	1.7	.7	C	Upper half serrated
578-11	OBS	WL	-	-	6.4*	2.7	.9	T	
578-12	OBS	WL?	-	-	2.2*	2.5	.7	FA	
578-14	OBS	-	1.2	-	3.8*	2.5	.6	FM	Serrated
578-15	OBS	HCB	-	-	3.9	1.6	.4	C	
578-16	OBS	RGA	.4	.3	2.5	1.4	.3	T	
578-18	OBS	RGC	.5	.6	2.0*	1.7	.2	T	
578-20	OBS	RGC	.5	.7	1.9*	1.4*	.3	T, B, B	
578-21	OBS	EE	1.1	1.6*	5.1	2.3	.5	Sb	Only a minute fragment of the basal "ear" is missing
578-22	OBS	RGC	.4	.5	1.6*	1.0	.2	T	
578-23	OBS	RGB	.4	.4	1.7	1.0	.2	C	
578-24	OBS	RGC	.4	.5	2.0	1.3*	.2	B	
578-25	OBS	RGC	.3	.4	1.5*	1.0*	.2	T, B, B	
578-27	OBS	WL	-	-	3.3*	1.9	.8	T	
578-28	BAS	-	-	-	9.1*	2.3	.8	FM	
578-29	OBS	GSS	.9	.9	2.9*	1.6*	.3	TBB	
578-30	OBS	RG?	.4	-	2.0*	1.5	.4	St	
578-31	OBS	RGC	.5	.7	2.2*	1.3	.3	T	
578-33	OBS	WL	-	-	5.5	1.7	.9	C	
578-34	OBS	UST	-	-	3.7*	2.4	.5	T	
578-35	OBS	RGB	.4	.4	2.1*	1.9*	.3	TB	
578-36	OBS	-	-	-	3.4*	2.0	.5	FM	
578-37	OBS	RGC	.5	-	2.5	1.9	.3	Sb	
578-38	OBS	WL	-	-	2.9*	2.2	.6	FM	
578-39	OBS	RGC	.5	.9	3.7*	1.5	.4	T	
578-40	OBS	WL	-	-	5.0	1.9	1.2	C	
578-41	OBS	WL	-	-	5.4*	2.6	.7	T	
578-42	OBS	RG	1.0	-	4.6*	1.6	.4	Sb	
578-43	OBS	RGC	.3	.4	1.7*	1.0	.2	T, B	

RAW MATERIAL

BAS = BASALT

CCS = CRYSTOCRYSTALLINE

OBS = OBSIDIAN

POINT TYPE

SEE TABLE 2

MEASUREMENTS (MAXIMUM)

NW = NECK WIDTH

BW = BASAL WIDTH

* = INCOMPLETE MEASUREMENT

FRAGMENT TYPE

C = COMPLETE POINT

T = TIP MISSING

S = STEM MISSING

Sb = STEM BASE MISSING

B = BARB OR CORNER MISSING

L = SIDE (LATERAL) MISSING

BS1/2 = WHOLE CORNER AND 1/2 STEM MISSING

FT = TIP ONLY

FB = BARB ONLY

FA = BASE ONLY

FS = STEM ONLY

FM = MID-SECTION FRAGMENT

D = DISTAL IMPACT SCAR

RESULTS

The archaeological reconnaissance at the Over-the-Horizon radar transmitter facility site resulted in the documentation of 36 prehistoric cultural resource sites, hundreds of isolated artifacts, and the collection of 43 potentially diagnostic artifacts. Figures 5 and 6 present the locations of sites, isolated finds and physiographic features. Illustrations of the collected artifacts are presented in Figure 7. Figure 8 presents the location of diagnostic point types. The sites are described briefly in the following sub-section. Table 4 summarizes the site data. Site forms are provided in Appendix D.

The Cultural Resources

35LK961 Lithic Scatter

Located in a blowout between dunes near their southern extent at the north edge of Buffalo Flat, this site is a very sparse concentration of about 50 obsidian flakes in an area of about 400 square meters. The site sediments are loose medium sands and the vegetation is comprised of very sparse greasewood, rabbit brush, and giant sage.

The site's presence in a blowout suggests that it may be partially wind deflated. No other evidence of disturbance was apparent.

35LK962 Lithic Scatter

This is a small scatter of approximately 20 obsidian and cryptocrystalline flakes located on the proposed access road to the project area approximately 1.05 miles north of its intersection with the Buffalo Wells Road. The cultural material was confined to an area only about 5 meters across. Although an effort was made to locate other artifacts no other cultural material was found surrounding this group. No vegetation occurs on the site, but it is surrounded by a dense stand of greasewood.

The incongruous tight clustering of the cultural material within a roadbed makes the integrity of this site dubious. Further investigation (test excavation) should resolve this issue.

35LK963 Plant Processing Site

This site consists of about three hundred cryptocrystalline and obsidian flakes and three hundred groundstone/fire-cracked rock fragments. In addition one large obsidian biface, 12 biface fragments and 3 unifaces were observed here. The cultural material is found in an area measuring 120 x 100 meters of hardpan flats or "pans" which support sparse stands of greasewood and bunch grass.

Figure 5 has been deleted for public release of this document.

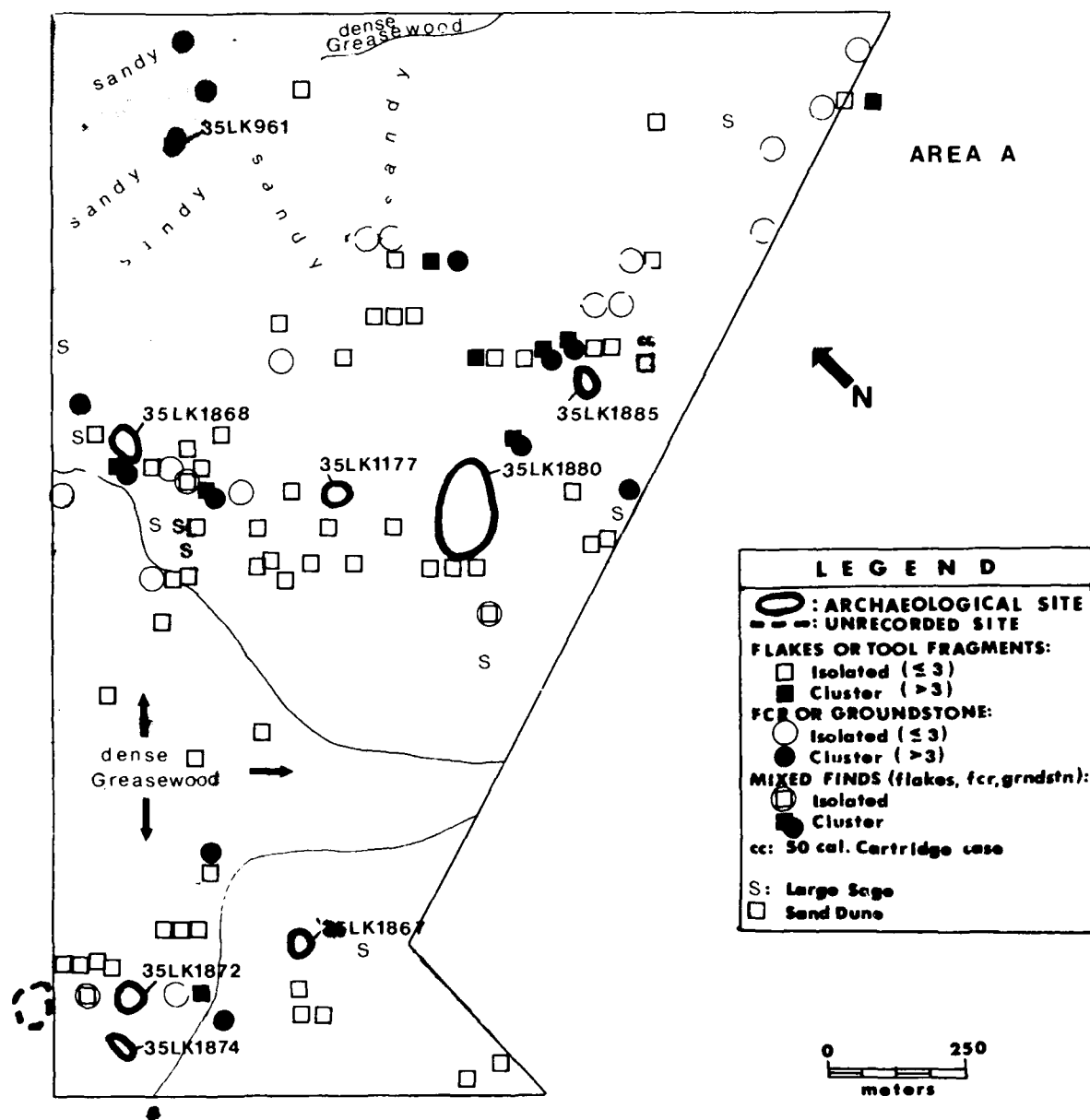


Figure 6a. Environmental features, isolated finds, and archeological sites in project area.

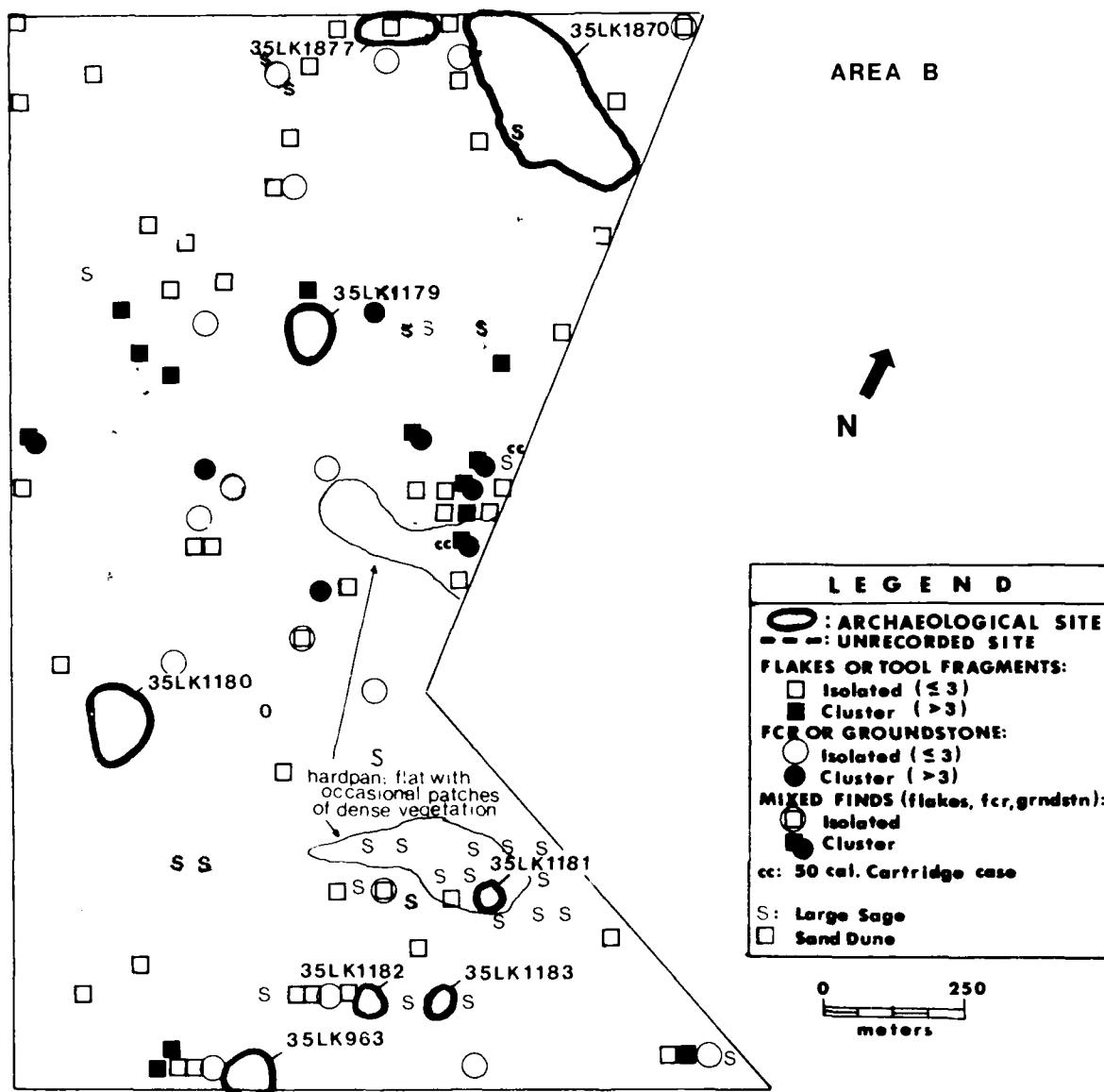
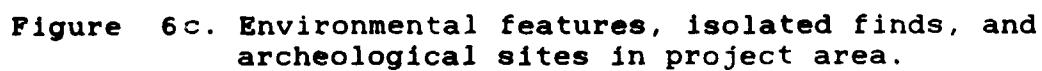


Figure 6b. Environmental features, isolated finds, and archeological sites in project area.



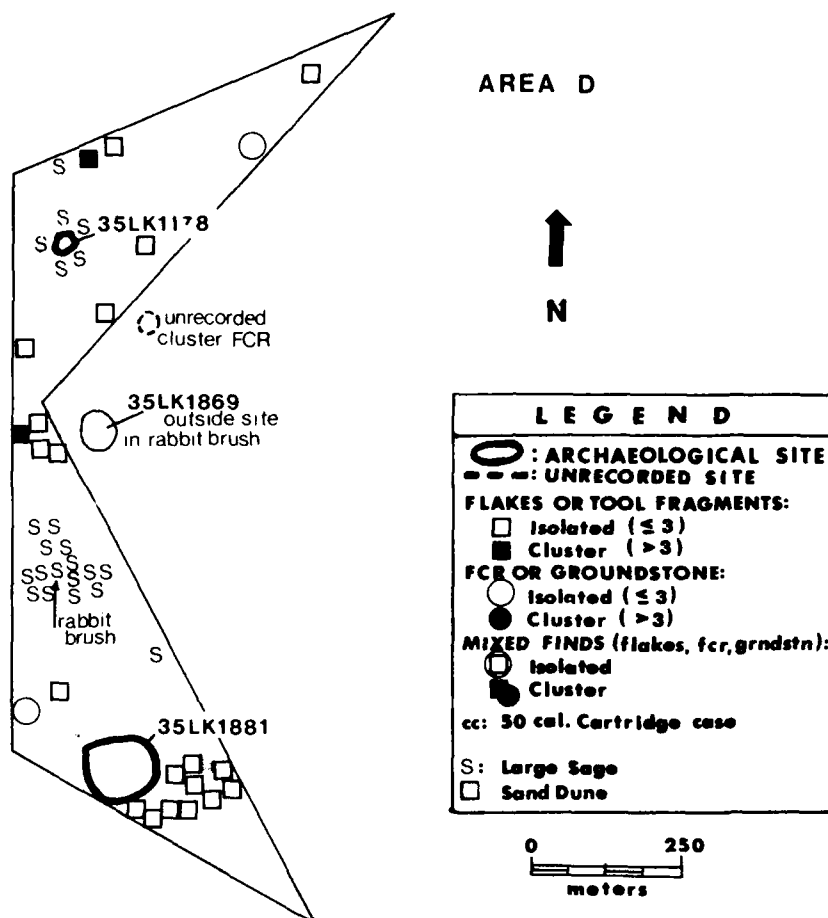


Figure 6d. Environmental features, isolated finds, and archeological sites in project area.



Figure 7. Selected diagnostic artifacts.

Key to figure 7.

Figure No.	Artifact Catalog No.	Material Type	Artifact Type*	Site No.
A	578-11	Obsidian	WL	35LK1180
B	578-41	Obsidian	WL	Isolated
C	578-28	Fine-grained basalt ?	WL	35LK1868
D	578-5	Chert	WL	35LK1870
E	578-27	Obsidian	WL	35LK1181
F	578-40	Obsidian	WL	Isolated
G	578-33	Obsidian	WL	35LK1884
H	578-10	Obsidian	HCB	35LK1180
I	578-21	Obsidian	EE	35LK1878
J	578-34	Obsidian	UST	35LK1884
K	578-3	Obsidian	SN	35LK1870
L	578-39	Obsidian	RGC	Isolated
M	578-15	Obsidian	HCB	35LK1174
N	578-37	Obsidian	RGC	Isolated
O	578-16	Obsidian	RGA	35LK1175
P	578-2	Obsidian	RGC	35LK1870
Q	578-18	Obsidian	RGC	35LK1873
R	578-20	Obsidian	RGC	35LK1876
S	578-31	Obsidian	RG?	35LK1869
T	578-35	Obsidian	RGB	Isolated
U	578-43	Obsidian	RGC	Isolated
V	578-24	Obsidian	RGC	35LK1878
W	578-22	Obsidian	RGC	35LK1878
X	578-23	Obsidian	RGB	35LK1878
Y	578-9	Obsidian	Crescent Fragment	35LK1180

*See Table 2 for point types.

Figure 8 has been deleted for public release of this document.

Table 4. Summary descriptions of cultural resource sites.

SITE #	SITE TYPE*	ELEVATION IN FT.	VEGETATION**	NSxEW AREA IN METERS	SETTING	SITE DESCRIPTION
35LK961	LS*	4310	DS/SS**	20x20	Dune blowout	ca. 50 obsidian flakes
35LK962	LS	4300	DS	20x20	Access road	ca. 20 obsidian flakes
35LK963	PPS	4300	DS	120x100	Hardpan flat	300 groundstone/FCR, 300 obsidian & CCS flakes, 12 biface frags & 3 unifaces.
35LK964	PPS	4300	DS	50x70	Remnant dunes	100 obsidian flakes, +5 groundstone/FCR, 1 CCS flake
35LK1174	PPS	4300	DS/SS	55x25	Remnant dunes and hardpan	70 groundstone/FCR, 10 scattered obsidian flakes, 1 biface, 1 Humboldt con. base point
35LK1175	PPS	4300	DS/SS	55x60	Remnant dunes and hardpan	80 groundstone/FCR, 20 obsidian flakes
35LK1176	PPS	4300	DS/SS	60x55	Remnant dunes and hardpan	50 groundstone/FCR, 10 obsidian flakes
35LK1177	PPS	4300	DS/SS	25x20	Hardpan flat	30-50 groundstone/FCR, 10 obsidian flakes
35LK1178	LS	4300	DS/SS	10x15	Hardpan flat	ca. 30 obsidian flakes in small cluster
35LK1179	PPS	4300	DS/SS	100x60	Hardpan flat	ca. 50 groundstone/FCR, 15 obsidian flakes, 1 core, and several chunks
35LK1180	PPS	4300	DS	70x100	Hardpan flat next to dune	10 groundstone/FCR, FCR, hundreds of obsidian flakes, 10 CCS flakes, 6 bifaces, 1 possible crescent
35LK1181	PPS	4300	DS	45x45	Hardpan flat	150 obsidian flakes, 3 cores, groundstone/FCR utilized flakes
35LK1182	PPS	4300	DS/SS	50x25	Hardpan flat	75 obsidian flakes, biface, cores, scrapers, groundstone
35LK1183	PPS	4300	DS/SS	25x20	Dune remnant	Two distinct clusters of basalt groundstone/FCR (50), 40 obsidian flakes, core, scraper, bifaces
35LK1184	PPS	4300	DS/SS	25x25	Hardpan flat	200 small basalt FCR/groundstone, 30 obsidian flakes, some retouched
35LK1865	PPS	4300	DS/SS	60x30	Dune remnant & hardpan	200 basalt groundstone/FCR, 1 red basalt pestle fragment, 30 obsidian flakes, 8 basalt flakes
35LK1866	F/G	4300	DS	10x15	Hardpan flat	40 groundstone/FCR fragments, mostly small and badly weathered
35LK1867	PPS	4300	DS	20x20	Hardpan flat	50-75 FCR, 20 groundstone, 10 obsidian flakes, 2 scrapers, 1 point tip

Table 4. Continued.

35LK1868	PPS	4300	DS/SS	25x20	Sandy hardpan flat	50 obsidian flakes, 20 basalt flakes, 75 groundstone/FCR, 1 large biface/point frag
35LK1869	PPS	4300	DS	25x16	Hummocky dunes	4 groundstone fragments, 100 FCR, 20 obsidian flakes, 1 mano, 2 points (Rosegate A&B)
35LK1870	PPS	4300	DS/SS	200x200	Hardpan	100 FCR/groundstone, obsidian & CCS flakes, obsidian & CCS projectile point (lanceolate & s. side notched), 1 mano
35LK1871	PPS	4300	DS/SS	200x50	Low dune on valley floor	1 metate fragment, other groundstone/FCR frags., 10 obsidian flakes
35LK1872	PPS	4300	DS/SS	20x20	Dune remnant	Groundstone/FCR fragments, 6 obsidian flakes in concentration, other flakes surrounding it
35LK1873	PPS	4300	DS/SS	80x80	Dune ridge	Biface, core, metate fragment, triangular point frag., lanceolate projectile point, FCR/groundstone, obsidian flakes
35LK1874	F/G	4300	DS/SS	1x10	Hardpan	Approximately 30 groundstone/FCR fragments
35LK1875	PPS	4300	DS	30x40	Hardpan	50 obsidian flakes, 4 clusters of FCR/groundstone
35LK1876	PPS	4300	DS	50x30	Hardpan	75 groundstone/FCR fragments and 20 obsidian flakes
35LK1877	LS	4300	DS/SS	50x150	Hardpan flats near dunes	150 obsidian flakes, 1 basalt spall, uniface, obsidian biface fragment
35LK1878	PPS	4300	DS/SS	90x70	Dune ridge	100 obsidian flakes, 100 FCR/groundstone frags, 4 small late obsidian points, 1 Elko point, 1 bowl mortar frag
35LK1879	LS	4300	DS/SS	35x40	Hardpan	50 obsidian flakes
35LK1880	PPS	4300	DS	180x100	Hardpan flat	Thousands of obsidian flakes, hundreds of groundstone fragments, hundreds of FCR
35LK1881	PPS	4300	DS/SS	180x70	Hardpan	Thousands of obsidian flakes, hundreds of groundstone/FCR, few CCS flakes
35LK1882	PPS	4300	DS	60x50	Remnant dunes	50 obsidian flakes, 1 projectile point tip, several scatters of FCR/groundstone
35LK1883	PPS	4300	DS	100x60	Remnant dunes & road	200+ obsidian flakes, occasional FCR/groundstone fragments
35LK1884	PPS	4300	DS/SS	100x60	Dune remnant	Several groundstone/FCR clusters, diffuse obsidian lithic scatter, 1 obsidian lanceolate point, 1 triangular point base

Table 4. Continued.

35LK1885	PPS	4300	DS/SS	50x30	Dune remnant	70 obsidian flakes, occasional piece of FCR/ groundstone
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* LS = Lithic scatter

PPS = Plant processing site

F/G = Fire-cracked rock/Groundstone assemblage

**DS = Desert Shrub

SS = Steppe Shrub

The dominant artifact type here is, by far, obsidian lithic debris. In terms of disturbance, aeolian deflation is a possibility as there are dune remnants in the area. The site sediment appears to be highly calcareous hardpan.

35LK964 Plant Processing Site

Situated among small dunes between patches of sparse greasewood and bunch grass, this site comprises about 100 obsidian flakes, approximately 5 pieces of groundstone/fire-cracked rock and one cryptocrystalline flake located for the most part in hardpan pockets. This site measures 50 x 70 meters. Obsidian lithic debris is the dominant artifact type. No diagnostic material was observed. No disturbance other than natural wind deflation is indicated.

35LK1174 Plant Processing Site

This site consists of approximately 70 groundstone/fire-cracked rock fragments, ten obsidian flakes, one biface fragment and one projectile point. Measuring 55 by 25 meters, this site was located in shallow dunes and pans among greasewood and sage. The site sediments are loose medium sands and calcareous hardpan.

The dominant artifact class here is weathered and fragmentary basalt groundstone fragments which may have been, in fact, fire-cracked rock. In addition to this material one Humboldt Concave Base point (see Table 2 for projectile point attributes) and one biface which appears to be a non-diagnostic point blade fragment were recovered. The projectile points are illustrated in Figure 7. No disturbance other than natural wind deflation was noted.

35LK1175 Plant Processing Site

Consisting of mainly fragmentary groundstone/fire-cracked rock concentrations over an area 55 by 60 meters, this site is located primarily in a small dune with a few hardpan areas. The vegetation here is sage, greasewood, rabbit brush and grasses. The site sediments are loose medium and hardpan.

Approximately 80 pieces of fragmentary groundstone/fire-cracked rock and 20 obsidian flakes were observed. One small Rosegate "A" projectile point was recovered. No evidence of recent disturbance was noted.

35LK1176 Plant Processing Site

This site is characterized by a fairly small (55 x 60 m) distribution of fragmentary groundstone/fire-cracked rock and obsidian lithic debris. It is found among large sage, greasewood, rabbit brush and bunch grass in remnant dune and hardpan areas of the valley floor. The dominating cultural material is badly weathered groundstone/fire-cracked rock fragments

(n = 50). Associated with those were ten obsidian flakes. No diagnostic materials were observed. Again, the only source of disturbance may be wind deflation.

35LK1177 Plant Processing Site

A rather small site, this deposit consists of 30-50 groundstone/fire-cracked rock fragments and 10 flakes covering a 25 x 20 meter area of hardpan. The vegetation of the site and surroundings is mostly greasewood with some sage and very little rabbit brush. This site may have been wind deflated but no other evidence of disturbance was apparent.

35LK1178 Lithic Scatter

This small sparse obsidian flake scatter encompasses an area of 10 x 15 meters, but the majority of lithic debris is found within a 5 meter radius of its center. It is located on the valley floor in hardpan in a dense concentration of rabbit brush and tall sage. At least some wind deflation is suggested here.

35LK1179 Plant Processing Site

Situated about 100 meters west of a hummocky dune ridge, this site is on the hardpan flats of the valley floor. Covering an area 100 x 60 meters it is primarily a scatter of groundstone/fire-cracked rock fragments and occasional obsidian lithic debris. The site is represented by two clusters approximately 50 meters apart. One broken obsidian biface fragment that appears to have been a lanceolate point fragment was recovered here.

The site's vegetation consists of greasewood, bunch grass, and occasionally sage brush. The site matrix is compact, calcareous hardpan. There was no evidence of recent disturbance here.

35LK1180 Plant Processing Site

This site is characterized by groundstone/fire-cracked rock, hundreds of obsidian flakes, cryptocrystalline flakes, bifaces and a probable crescent fragment. In addition, a Humboldt concave-base and a lanceolate projectile point were recovered here. The site measures 70 meters by 100 meters and is situated on hardpan flats adjacent to and west of a one meter high continuous dune which runs north/south. The vegetation here is exclusively sparse greasewood and the site matrix appears to be calcareous hardpan.

35LK1181 Plant Processing Site

Located about 100 meters east of a sand dune ridge this site lies on hardpan flats among sparse greasewood. It is comprised of 100-150 obsidian flakes, three cores, one small lanceolate projectile point, several groundstone/fire-cracked rock fragments and a few cryptocrystalline flakes covering an area about 45 meters across. There was evidence of disturbance although wind deflation is certainly a possibility.

35LK1182 Plant Processing Site

This diffuse scatter of obsidian lithic debris, one groundstone fragment, and a few lithic tools covers an area of hardpan flat approximately 50 meters by 25 meters. The cultural material is primarily obsidian flakes (ca. 50), a few tool fragments, one groundstone fragment and one projectile point. The vegetation at this site is tall sage, greasewood and spiny hopsage. About 40 meters to the south there is another small cluster of about 20 obsidian flakes. Again, no evidence of disturbance other than natural wind deflation was observed.

35LK1183 Plant Processing Site

This site is represented by two clusters of basalt fire-cracked rock/groundstone about 15 meters apart. The southeastern cluster contains about 40 obsidian flakes; the northern cluster exhibited very few lithics, i.e., one core, one scraper and one flake. The site is entirely within a very low sandy hummock about 25 meters by 20 meters. The vegetation here included sage and rabbit brush. No evidence of recent disturbance was observed.

35LK1184 Plant Processing Site

This cluster of 100-200 groundstone/fire-cracked rock fragments and 20 obsidian flakes is found on the hardpan flats away from dispersed stands of greasewood. The groundstone/fire-cracked rock fragments are distinctly broken and weathered into pieces smaller than 3 cm. No disturbance other than wind deflation was evident here.

35LK1865 Plant Processing Site

This site extends from the top of a low sand dune down into hardpan flats covering an area 60 meters by 30 meters. Sage and cheatgrass are found on the dune but only greasewood is found on the flat. The cultural material observed at this site included 150-200 groundstone/fire-cracked rock, 50 obsidian flakes, 10 fire-cracked basalt flakes, several obsidian biface fragments and a vesicular basalt pestle fragment. Only the pestle fragment was collected. Wind deflation is the only evidence of disturbance here.

35LK1866

Groundstone/Fire-cracked Rock Assemblage

This aggregate of groundstone/fire-cracked rock is found along a low dune and associated hardpan flat covering an area 10 meters by 15 meters. Approximately 50 basalt fragments were observed. These evidenced weathering and breakage in that none of them exceeded 4 cm in any dimension. Some were as small as pea-size. No other cultural material was observed here. No disturbance other than perhaps wind deflation is evidenced here.

35LK1867

Plant Processing Site

This site is a scatter of groundstone/fire-cracked rock clusters and associated obsidian flakes located on a sandy flat among greasewood and rabbit brush. The site covers an area about 20 meters across and is characterized as 75 groundstone/fire-cracked rock, 15 definite groundstone and 10 flakes. This site probably has been partially wind deflated.

35LK1868

Plant Processing Site

This site is a fairly small (20 meters x 25 meters) cluster of very fragmentary groundstone/fire-cracked rock and obsidian lithic debris. Artifacts observed here include 75 groundstone/fire-cracked rock, about 20 fine grained basalt flakes, 30 obsidian flakes and two biface fragments. One of the basalt biface fragments was collected. It appears to be a large lanceolate point fragment. The site is on the hardpan flats of the valley floor among greasewood, rabbit brush and sage. Little evidence of disturbance was noted here.

35LK1869

Plant Processing Site

Located among low hummocky sand dunes and an adjacent hardpan flat this 16 x 25 meter site's observed assemblage includes about 100 groundstone/fire-cracked rock, approximately 20 obsidian flakes and one complete basalt mano. Two Rosegate series projectile points were recovered from this site. The vegetation at this site is limited to rabbit brush and occasional tufts of cheat grass. This site may have been partially wind deflated.

35LK1870

Plant Processing Site

This site consists of a number of dispersed clusters of cultural material covering an area of hardpan flats 100 x 200 meters. It is located between two low dune ridges about 100 meters apart. A variety of cultural material was observed here including approximately 100 groundstone/fire-cracked rock fragments in distinct clusters, hundreds of cryptocrystalline and obsidian flakes, one mano, two bifaces, and four projectile points. Among the projectile points were found two Rosegate series points, one lanceolate and one large but delicate side-notched style. The vegetation here was sparse greasewood.

Aeolian deflation of unknown severity is the only disturbance evidenced here.

35LK1871 Plant Processing Site

Located on the east face of a long sand ridge, this site consists of several groundstone/fire-cracked rock and about 10 obsidian flakes. In addition, one broken metate was observed. This site covers an area 200 meters by 50 meters. Plant species recognized here were greasewood, tall sage, and cheat grass. Little disturbance other than probable wind deflation is indicated here.

35LK1872 Plant Processing Site

This site is composed of one main cluster of groundstone fragments/fire-cracked rock, and six obsidian flakes plus a few other obsidian flakes in the surrounding area. Located on a sandy flat on the valley floor the site is found among sparse greasewood and sage. This site is fairly small, covering an area 20 meters across. No disturbance other than wind deflation was observed here.

35LK1873 Plant Processing Site

Located on a sand ridge and adjacent sage flat this site consists of at least three loci of fairly dense cultural material with scattered debitage in the surrounding area. Measuring approximately 80 meters across, this site was indicated by groundstone/fire-cracked rock, obsidian lithic debris, one metate fragment, one Rosegate "C" projectile point, one obsidian core and an obsidian biface fragment which appears to be a basally ground point base fragment. Vegetation observed here included sparse stands of sage and greasewood. No disturbance other than perhaps wind deflation was evidenced here.

35LK1874 Groundstone/Fire-cracked Rock Assemblage

This site is a linear scatter of 30 pieces of groundstone/fire altered rock located on a hardpan flat among sparse sage and greasewood. It measures one meter by ten meters and has not witnessed any disturbance other than possibly wind deflation.

35LK1875 Plant Processing Site

Located on a hardpan flat among greasewood, this site consists of fairly dense clusters of groundstone/fire-cracked rock separated by a thin scatter of obsidian lithic debris. Artifacts observed include about 50 pieces of obsidian lithic detritus and approximately 70 groundstone/fire-cracked rock distributed over an area 30 meters by 40 meters. The vegetation here consists primarily of greasewood. No evidence of disturbance was recorded.

35LK1876 Plant Processing Site

Located on hardpan flats along the proposed access road to the radar facility, this site consists of scattered groundstone/fire-cracked rock and obsidian lithic debris. Groundstone/fire-cracked rock comprises the majority of the cultural material with approximately 75 pieces. About 20 obsidian flakes were also recorded. One projectile point, a Rosegate "C" specimen, was recovered. This site measures 50 meters by 30 meters. The only vegetation recorded in the area was greasewood. Wind deflation and the construction of the access road are potential sources of disturbance here.

35LK1877 Lithic Scatter

Found on hardpan flats on both sides of a low sand ridge among sage and greasewood, this site consists of obsidian flakes, 1 uniface and a biface fragment. In addition one basalt spall was observed. The site measured 50 x 150 meters. Other than possibly wind deflation no disturbance was evidenced.

35LK1878 Plant Processing Site

This site is a continuous sand ridge that supports a sparse stand of greasewood and an occasional sage. Measuring 90 x 75 meters it evidenced cultural material in the form of 100 obsidian flakes, 100 groundstone/fire-cracked rock, four small Rosegate series obsidian projectile points, one Elko point and one bowl mortar fragment. Little evidence of disturbance was noted here.

35LK1879 Lithic Scatter

This small sparse lithic scatter of about 50 obsidian flakes was noted on hardpan flats among occasional greasewood and sage. Measuring 35 x 40 meters this site evidenced no disturbance other than possibly wind deflation.

35LK1880 Plant Processing Site

This site is comprised of thousands of obsidian flakes and hundreds of groundstone/fire-cracked rock fragments found in clusters on an open hardpan flat among very sparse greasewood, sage and rabbit brush. As at some of the other sites recorded we noticed that the groundstone/fire-cracked rock seemed to be arrayed in small well banded clusters here, suggesting fire features of some sort. This site measured 180 meters by 100 meters. This site location, on the hardpan flats, suggests at least partial wind deflation.

35LK1881 Plant Processing Site

Comprised of thousands of obsidian flakes, a few cryptocrystalline flakes and hundreds of groundstone/fire-cracked

rock, this site is located on open hardpan flats among sparse stands of greasewood and occasional sage. Measuring approximately 70 meters by 180 meters it evidenced no disturbance other than perhaps wind deflation.

35LK1882 Plant Processing Site

This site is a sparse obsidian lithic scatter and associated groundstone/fire-cracked rock in a 50 meter by 60 meter area. It is located on sand dunes in a dune ridge system on the dry lake bed. Vegetation here is primarily greasewood with occasional grasses. No disturbance other than perhaps wind deflation was indicated.

35LK1883 Lithic Scatter

Consisting of approximately 200 obsidian flakes scattered over a 100 meter by 60 meter area, this site is located along the access road to the project area. It is found among very low remnant dunes where greasewood and various grasses were the primary vegetation. Evidence of disturbance was present in the form of the graded road bed and, perhaps, wind deflation.

35LK1884 Plant Processing Site

This site consists of several groundstone/fire-cracked rock concentrations and a diffuse obsidian lithic scatter distributed over an area measuring 60 meters by 100 meters. The site is located on a sand ridge and adjacent hardpan flats. The vegetation here includes greasewood, sage, and rabbit brush. Cultural material observed at this site includes the groundstone/fire-cracked rocks and lithic debris as mentioned above and a triangular and a lanceolate projectile point. No evidence of disturbance, with the exception of possibly wind deflation, was observed.

35LK1885 Plant Processing Site

This site consists of approximately 30 obsidian flakes in close proximity and a larger, more diffuse lithic scatter with occasional groundstone/fire-cracked rock fragments. It is situated on the east side of a small sand ridge system on the dry lake bed. The site measures 50 meters by 30 meters. The vegetation here is predominantly greasewood with some sage, grasses and occasional rabbit brush. No disturbance except wind deflation is indicated.

INTERPRETATION

Considerations of Time

In the absence of materials amenable to absolute dating methods our only recourse to the dating of artifacts and inferentially the components recorded in this study is cross-dating by projectile point styles. While there is considerable error associated with this method, it will have to suffice until more data are available.

A review of the project area assemblages dated by these means (Table 5) indicates a substantial time range, perhaps spanning the last 10,000 years. The majority of the assemblages, however, appear to be fairly late - dating to the last 2000 years. Of the nine assemblages for which we provide plausible dates five, or 55%, are characterized by Rosegate series projectile points presumed to have been used after AD 1.

Earlier assemblages occur, as inferred from a number of point styles. One assemblage, 35LK1180 where what appears to be a crescent fragment was recovered, may evidence Paleo-Indian use of the area. The data suggest, however, more intensive human occupation during the later Holocene.

This pattern is born out when the frequencies of all projectile points, both isolated and from recorded sites, are tabulated. Those points attributable to only the last 2,000 years, the Rosegate series and others, number 15 or 54% of the classifiable objects recovered. This pattern is somewhat at odds with the ethnographic data as discussed by Toepel (1982), which suggest little or no use of the valley during the historic period. Further light on this subject will be shed when more data regarding chronology, function of the sites in the pre-historic settlement system, and paleo-environments are collected. It is difficult to imagine any intensive occupation of the Christmas Lake Valley floor given the contemporary environmental conditions.

It should be noted that considerable bias is introduced to the interpretation of this chronological evidence by casual collection of material from the surface of these sites. Our confidence in the chronological assignments will be enhanced by larger collections gathered by systematic means. Also, considerable refinement is required in the relative dating method employing projectile point styles. The lanceolate projectile point styles which are found in the earliest dated components in the region (Bedwell 1973), and at sites recorded during this reconnaissance still have very little utility as time markers when not associated with material dated by other means. And, although they are often intuitively thought to represent great antiquity at archaeological sites, I am not convinced that it is so.

Table 5. Tentatively Dated Assemblages.

Site Number	Diagnostic Material	Plausible Age
35LK 961		
35LK 962		
35LK 963		
35LK 964		
35LK 1174	1-HCB	4000-1000 BC
35LK 1175	1-RGA	AD-1 Contact
35LK 1176		
35LK 1177		
35LK 1178		
35LK 1179	1 WL	?
35LK 1180	1 crescent frag. 1 WL	
	1-HCB	10,000-1000 BC
35LK 1181	1 WL	?
35LK 1182	1-GSS	3000-500 BC
35LK 1183		
35LK 1184		
35LK 1865		
35LK 1866		
35LK 1867		
35LK 1868		
35LK 1869	1-RG	
	1-RGC	AD-1 Contact
35LK 1870	1-RG 1 SSN	
	1-RGC 1 WL	AD-1 Historic times
35LK 1871		
35LK 1872		
35LK 1873	1-RGC	AD-1 Contact
35LK 1874		
35LK 1875		
35LK 1876	1-RGC	AD-1 Contact
35LK 1877		
35LK 1878	1-EE 3-RGC	
	1-RGB	2000 BC Contact
35LK 1879		
35LK 1880		
35LK 1881		
35LK 1882		
35LK 1883		
35LK 1884		
35LK 1885		

Considerations of Space

Of particular interest to archaeologists in the pursuit of prehistoric settlement structure and paleo-climatic data in this region is the reconstruction of pluvial Fort Rock Lake margins throughout the Holocene. Bedwell (1973) fairly confidently documents the Lake level at 4386 feet during the first occupation of Fort Rock Cave 13,200 ± 720 years B.P. A radio-carbon date of freshwater snail and mussel shells at the 4400 foot terrace south of the settlement of Christmas Lake Valley produced a confirming date of 13,380 ± 230 years B.P. Subsequent levels of the lake have yet to be documented.

We had hoped that physical evidence of prehistoric lake-shores would be evident in the project area in the form of terrace remnants, strand lines, etc. Based on surface observations such was not the case. In the absence of those data we attempted to plot the locations of temporally sensitive stylistic forms documented during this project and that reported by Toepel (1982), hoping that patterns in their distribution on the landscape might suggest linear lake margins. Two primary assumptions associated with this effort are that the projectile points represent or co-occur with settlements and that those settlements here indeed are associated with lakeshores. The locations the points were found are shown in Figure 8; no striking pattern emerges from this exercise.

It would seem likely then that more data, particularly paleo-environmental data, will be required before even preliminary statements regarding the locations of prehistoric lakeshores in the Christmas Lake Valley can be made.

Site Classification

As a result of the cultural resource reconnaissance in the Buffalo Flat area of Christmas Lake Valley we documented the location and surface constituents of five lithic scatters, 29 plant processing sites and two groundstone/fire-cracked rock assemblages. The second type of groundstone/fire-cracked rock assemblage has not been recorded in this area during previous projects. It is comprised of groundstone/fire-cracked rock fragments only. While the nature of this site type is not fully understood at this time, future work in the area may help to demonstrate its role in the prehistoric settlement system.

With regard to the location of the various types of sites found in the area the findings of this reconnaissance are generally consistent with the conclusions forwarded by Toepel (1980, 1982), specifically plant processing sites almost always occur in the dune environment of the valley floor. While we have fundamental reservations about the determining criteria for "plant processing sites" we conclude that the classification nevertheless seems to distinguish between sites in an

archaeologically meaningful way. Regardless of the origins and functional association of the groundstone/fire-cracked rock material category, the site class "plant processing site" appears to exhibit spatial patterning, i.e., more common on the valley floor as opposed to the uplands. Future work at these sites must segregate those items which exhibit discrete wear patterns, i.e., groundstone, from unworn disintegrating basalt, which in all probability is fire-cracked rock.

SIGNIFICANCE

Determinations of cultural resource significance derive primarily from the criteria for the nomination to the National Register of Historic Places (36CFR 60.6). Here the quality of significance is considered present in sites which possess integrity of location, design, setting, materials, workmanship, feeling and association, and that have yielded or may be likely to yield information in prehistory or history.

Critical to the assessments of significance of cultural resource sites are a number of considerations, not the least of which is the integrity of the archaeological deposit. Although partial wind deflation is indicated, short of sub-surface examination we are unable to evaluate the degree of disturbance to the sites recorded herein. If the site sediments are intact, and in the absence of any other information they should be considered so, then they can be evaluated by their potential to contribute to a recognized field of archaeological inquiry or to the resolution of archaeological problems previously posed for the region (Benson 1985).

The problem for which the archaeological sites recorded during the project are uniquely suited is the reconstruction of prehistoric land use patterns or presumed lake margin adaptations on Buffalo Flat throughout the mid-to-late Holocene. Such an inquiry would require a classification of the archaeological sites along the lines of Toepel (1980, 1982) but incorporating a greater number of intentionally defined site dimensions, e.g., functionally defined tool types, feature attributes, etc.

In concert with this inquiry, a better understanding of paleo-environmental features at the time of human settlement is needed before the adaptive system represented by the settlement can be understood. Not only would it be necessary to document the location of lake margins through the Holocene, but also we need a broader view of the local climatic and environmental conditions which have prevailed throughout the periods of human occupation in the region.

Given the rudimentary nature of our understanding of human adaptations in the Fort Rock Basin during the mid-to-late Holocene, further investigations of the cultural resources in Christmas Lake Valley are certain to contribute to our better understanding of the prehistory of the region. Definitive assessments of significance on a site-by-site basis must await further investigations at the sites.

CONCLUSION

The current project resulted in the documentation of 36 heretofore unrecognized prehistoric sites. These sites can be divided into three site types by applying a previously developed site classification; lithic scatters, plant processing sites and groundstone/fire-cracked rock assemblages. Plant processing sites dominated, representing 80% of the recorded sites. Temporally sensitive artifact types indicate that the reconnaissance area was occupied throughout the greater part of the Holocene but more intensively during the last 2000 years.

One may surmise that the sites recorded herein represent lake or marsh-margin settlements. It should be noted, however, that until substantial paleo-environmental data are collected such conclusions must remain at the level of conjecture.

Given the current poorly developed state of knowledge regarding the later prehistoric subsistence/settlement systems in the region, data from these sites must be considered essential in the reconstruction of settlement systems and adaptive strategies during the mid-to-late Holocene.

MANAGEMENT RECOMMENDATION

The greatest source of problems encountered during field-work stemmed from the absence of landmarks or project boundaries in the project area. Previous work in the area has also suffered from this difficulty (Toepel, 1982). Even with the aid of a professional surveyor and state-of-the-art engineering equipment there remains some doubt as to the relationship of the 1985 reconnaissance area to the proposed facility location. It is for this reason that our first priority recommendation is for the establishment of on-the-ground project boundaries.

Before starting any future fieldwork the sponsoring agency should provide on-the-ground boundary markers for the project. Once the project boundaries are established, a two phase evaluation of cultural resources is recommended. The first effort should be to place those sites recorded by Toepel (1982) and those presented in this report in spatial relationship to the project area. Re-establishing the sites' locations on the ground, and then plotting them on an aerial photograph which shows the project location would be a constructive beginning.

It should be noted that adopting the aforementioned recommendation may entail considerable reconnaissance. Since the absence of landmarks on the valley floor required previous archaeological investigators to take bearings on distant land forms for orientation, considerable error may be anticipated in the location of recorded sites. Re-establishing the location of these previously identified sites may require substantial effort.

As the location of each site is confirmed, it would be appropriate and cost effective to install permanent datums and temporary markers visible for a considerable distance. At that time additional data could be collected from the sites. Most important would be determinations regarding the sites' sub-surface distributions and depths. This phase may also entail intensive surface inspection and the collection of temporally diagnostic artifacts. We suggest a program of systematic augering and surface inspection be adopted at each site to obtain data on site size and depth. The collection of diagnostic artifacts would be a first step toward a temporal classification of the sites. The reliability of this classification could be enhanced with the collection of sufficient numbers of obsidian flakes for obsidian hydration dating and x-ray fluorescence spectography sourcing.

While in the field during this phase, preliminary paleo-environmental data could be collected to help focus, and to outline the potential for, paleo-environmental research. This could be accomplished by placing some machine or hand dug trenches in the dunes and the pans of the valley floor and inspecting the profiles for the occurrence of tephra or lake margin sediments.

Having gathered preliminary information regarding site size, depth, and age and assessing the amount and nature of paleo-environmental data available in the project area, the stage would be set for the next phase of inquiry -- that being archaeological test excavations.

Test excavations would be required to assess the number and nature of components at each site as well as the integrity of the cultural deposits. On the basis of the test excavation results, determinations of significance and eligibility to the National Register of Historic Places could be made. These determinations would depend largely on a classification of the sites in terms of integrity, diversity, age and number of components as well as other criteria.

Such determinations are critical prior to the making of other management decisions. For example, Toepel (1982) has suggested that the sites on the valley floor have evidence of aeolian deflation. If that can be demonstrated, it will affect the way we identify site significance. Single component sites with no mixing may well be deemed more significant than multiple component sites that have been mixed as a result of deflation.

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APPENDIX A

Projectile Point Class Descriptions

(After Pettigrew 1985)

The projectile point description which follows was taken from Pettigrew (1985). Because they are one of the most common tools found in archaeological sites and exhibit stylistic variability, projectile points are the most useful chronological indicators found in sites in the northern Great Basin. This fact is, of course, widely known, but it has been recently amplified and clarified by Thomas (1981), who argues that projectile points are most useful as temporal markers when they are classified only according to attributes that are demonstrably chronologically sensitive, rather than by a wide range of visually distinctive criteria. The usefulness of this approach has been demonstrated by others (e.g., Pettigrew 1981b) as well.

The 13 point types defined here for the Lake Abert vicinity are intended to be used as temporal types, though they should also be fairly useful as descriptive types. The typology was developed over a period of six years of Lake Abert research out of attempts to cross-date point styles as well as analyses of temporal patterns exhibited within the Lake Abert data, and is an adaption of the system used for Stinkingwater Pass (Pettigrew 1979d:59-61). The classification is taxonomic, and constructed so as to allow direct correspondence between the defined types and the widely used Great Basin binomial types (see esp. Heizer and Hester 1978, Thomas 1981).

Among the attributes used to discriminate between types, one of the most useful and important is neck width (NW), used and measured as defined by Corliss (1972). The points from the Lake Abert sites have been shown (Pettigrew 1981a) to display bimodality in this dimension, with the narrow-necked mode at 5 mm and the broad-necked mode between 10 and 12 mm, and the minimum between the two modes at about 8 mm. This is not surprising, since bimodality in neck width has been previously established in Oregon and neighboring areas (Corliss 1972, Pettigrew 1981b:14, Pettigrew 1982:138, Pettigrew 1979d:60).

It is obvious from inspection of the Lake Abert points that those with narrow necks (less than 8 mm) strongly tend to be smaller and lighter than those with broad necks (8 mm and more), allowing neck width to be a major discriminating criterion between two major, and demonstrably temporally distinctive, groups of points. However, neck width does not appear to be completely effective in separating those two major groups, since some narrow-necked points appear robust and occur in contexts suggesting contemporaneity with broad-necked styles. For this reason, basal width (BW) and weight (WT) are used as additional distinguishing criteria, to separate robust points (BW greater than or equal to 10 mm, WT greater than or equal to 1.65 g) from the narrow-necked group and join them with the broad-necked specimens.

Other attributes used to discriminate types of projectile points are as follows. Stemmed points are those with distinct notches or shoulders, defining a hafting element separate from

the blade. Side-notched points are those with notches whose axes are approximately perpendicular to the long axis of the point. Lanceolate points have blades whose lateral edges are convex and, at least at one location, parallel to the long axis of the point. Triangular points have blades whose lateral edges are generally straight, diverging from the point tip, and terminating at a distinct corner. For lanceolate points, the distinction between concave and convex bases requires no measurement, since there is no overlap between the two groups and no lanceolate points in the collection have straight bases. For broad-necked points, however, the distinction between concave and convex bases requires a measured criterion, since there is continuity between the two extremes. This measured criterion is the basal indentation ratio (BIR) defined by Thomas (1981:11) and illustrated in Figure 17 (Figure 4 in this report). For points with broken tips, BIR is estimated by reconstructing the point (and thus the original location of its tip) on the basis of the remnant blade.

For narrow-necked, non-side-notched points, the shape of the stem is narrowest at the neck, but a non-diverging stem is not. Diverging stems are often referred to as "expanding". For non-diverging-stemmed points, the shape of the blade corner is diagnostic. A barbed point is one whose blade corner or shoulder projects downward, even if only slightly; and a shouldered point has no such downward projection at the corner of the blade (see Pettigrew 1981b:15 for an illustration of the blade corner shape and the stem shape criteria). The final attribute to mention is the stem ratio (SR), which is defined as the ratio of NW to BW. This ratio is used instead of the angular measurement recommended by Thomas (1981:11), because it is easier to use, and produces essentially the same result, i.e., separating the "Gatecliff" or "Pinto" series from the "Elko" series.

The projectile point types found at Lake Abert are presented below, including for each type a discussion of the traditional Great Basin binomial types that appear to be similar and the estimate chronological range based on cross-dating (cf. Heizer and Hester 1978, Thomas 1981, Fagan 1974, Pettigrew 1981b). The types are arranged in an assumably approximate chronological sequence (Type SSN being the most recent), though it may be expected that analysis will show that one or more types differ from their originally assumed temporal placement. Also, changes and refinements of the typology are to be expected as analysis of new data from the locality reveals new chronological and other distributional patterns.

Type SSN (small side-notched) is narrow-necked and side-notched. Specimens typically have triangular blades and straight or concave bases. This type is comparable to the Desert Side-notched type of the Great Basin and similar small side-notched points found throughout the West (Heizer and Hester 1978, Baumhoff and Byrne 1959, Pettigrew 1981b:16, Baxter et al.

1983), and appears to have been used between about A.D. 1200 and early historic times.

Type UST (unstemmed triangular) is unstemmed and triangular, with a straight base. This type resembles the traditional Cottonwood Triangular type of the Great Basin (Heizer and Hester 1978:11), with the exception that no Type UST points found so far at Lake Abert have concave bases, as some Cottonwood Triangular points do. Type UST points may simply be unnotched blanks for Type SSN or other small, triangular types. Cottonwood Triangular points are recorded in the Great Basin beginning at A.D. 900 and continuing into historic times (Heizer and Hester, op cit.), a period which seems reasonable for Type UST as well.

Type RGA (Rosegate A) is stemmed, not notched, narrow-necked, barbed, with a non-diverging stem. As mentioned above, those points with BW 10 mm or greater or with WT 1.65 g or greater are not grouped with narrow-necked points, and are not included in Type RGA or other narrow-necked types. Type RGA would probably be traditionally classed as Rose Spring Contracting Stem (Heizer and Hester 1978:7), while Thomas (1981) would group it with his temporal type, the Rosegate series. The introduction of the Rosegate series is argued by Thomas (op. cit.) to be about A.D. 700 at Gatecliff Shelter. However, Heizer and Hester (1978:9) point to evidence of its earlier appearance in the Great Basin, and this author has already shown the probability that narrow-necked points were introduced in the Pacific Northwest between 500 and 100 B.C. (Pettigrew 1982:41-42). A reasonable chronological assignment for Type RGA and other narrow-necked and corner-notched points is period from about A.D. 1 to historic contact.

Type RGB (Rosegate B) is stemmed, not side-notched, narrow-necked, shouldered, with a non-diverging stem. This group would be traditionally classed in the same way as Type RGA above, with the same estimated chronology. It is separately classed here in order that we might test the possibility that it exhibits unique chronological patterning, an idea suggested by the presence of points similar to those in some parts of southwestern Oregon (Pettigrew 1980c; unpublished data).

Type RGC (Rosegate C) is stemmed, not side-notched, narrow-necked, with a diverging stem. Both barbed and shouldered specimens are included. Traditional named types that would be included are Rose Spring Corner-notched, Eastgate Split Stem and Eastgate Expanding Stem (Heizer and Hester 1978:7), and Type RGC would easily fit into Thomas' (1981) Rosegate series. The temporal range suggested here is the same as that for Type RGA.

Type EE (Elko Eared) is stemmed, not side-notched, and broad-necked, with SR less than 0.85 and BIR less than or equal to 0.93 (concave base). This group is comparable to the traditionally defined Elko Eared type (Heizer and Hester 1978:5), most specimens of which in the central, western and northern

Great Basin probably date to the period 1300 B.C. to A.D. 700 (Thomas 1981), though dates as early as 2000 B.C. and as late as A.D. 1000 are possible.

Type ECN (Elko Corner-notched) is stemmed, not side-notched, and broad-necked, with SR less than 0.85 and BIR greater than 0.93 (straight or convex base). This class would traditionally be assigned to the Elko Corner-notched type and resembles also the Martis Corner-notched type (Heizer and Hester 1978:2, 13). The age of Type ECN is probably the same as that for Type EE, as both Thomas (1981) and Heizer and Hester (1978:5) argue.

Type GSS (Gatecliff Split Stem) is stemmed, not side-notched, broad-necked, with SR greater than or equal to 0.85 and BIR less than or equal to 0.97 (concave base or split stem). This type is essentially the same as Thomas' (1981) Gatecliff Split Stem type, incorporating traditional Pinto Series types (Heizer and Hester 1978:3-5). The estimated temporal range of Type GSS, based on estimates for the Pinto Series and the Gatecliff sequence, is about 3000 to 500 B.C.

Type GCS (Gatecliff Contracting Stem) is stemmed, not side-notched, broad-necked, with SR greater than or equal to 0.85 and BIR greater than 0.97 (straight or convex base). This group is essentially the same as Thomas' (1981) Gatecliff Contracting Stem type, and would include also the Gypsum type (Heizer and Hester 1978:15). The temporal placement of Type GCS is considerably less certain than those types previously discussed, because of the relative lack of published information about this style. The suggested span is the period from 3000 to 500 B.C., the same as Type GSS.

Type WL (Willow leaf) is unstemmed and lanceolate, with a convex base, including small to large willow-leaf-shaped points. The closest named Great Basin analogues are Cottonwood Leaf-shaped and Cottonwood Bipointed, considered to date from the period A.D. 900 to historic contact (Heizer and Hester 1978:11-12), and Cougar Mountain points (Layton 1970), considered to have been in use around 6500 B.C. (Heizer and Hester 1978:16). Also similar are Cascade points, a Plateau variety that is reported by Weide (1968) from Warner Valley just east of Lake Abert in her "Early" period. The age of Type WL at Lake Abert is an open question, though there is a natural tendency to expect it to be early in the sequence. I am not convinced that it is early, however.

Type HCB (Humboldt Concave Base) is unstemmed, lanceolate, with a concave base and a narrow basal section. This type includes the traditional Humboldt Concave Base types (Heizer and Hester 1978:2-3), estimated to range in age from 4000 to 1000 B.C., although the age of the style is still somewhat controversial. The sample-size of types HCB and LCB, both with concave bases and lanceolate blades, are small, making the distinction between them still somewhat impressionistic and not

strictly defined. Future work will no doubt result in either a refinement of the distinction or a reclassification of these points.

Type LCB (lanceolate, concave base) is unstemmed, lanceolate, with a concave base and a broad basal section. Into Type LCB would be fit the traditional Black Rock Concave Base type (Clewlow 1968, Heizer and Hester 1978:14), tentatively estimated to range in time from 9000 to 5000 B.C. Other styles with different chronological ranges may be present also, however.

Type LSN (large side-notched) is side-notched and broad-necked. Specimens typically have lanceolate blades and concave bases, and resemble what have been termed Northern Side-notched points (Heizer and Hester 1978:13). Type LSN would also include other large, side-notched varieties, such as Bitterroot, Side-notched and Elko Side-notched, however, and so is defined very much similarly to Thomas' (1981) class, Large Side-notched points. Data for temporal estimates are somewhat ambiguous, but a good guess for this group would be the period 5000 to 2000 B.C.

APPENDIX B

Artifact Catalog

CHRISTMAS LAKE VALLEY ARTIFACT CATALOG Lot #578

CATALOGUE #	DESCRIPTION	QTY/WT	PROVENIENCE	COMMENTS	PHOTO #	DATE COLLECTED
578-1	Dk. red cryptocrystalline biface fragment (point midsection frag)	1	1870 Surface	Mapped on site record		10-85
578-2	Small obsidian Rosegate "C" projectile point	1	1870 Surface	Mapped on site record		
578-3	White chalcedony Desert side-notched projectile point frag	1	1870 Surface			
578-4	Obsidian Rosegate series projectile point frag	1	1870 Surface			
578-5	Orange chert lanceolate projectile point frag	1	1870 Surface			
578-6	Obsidian biface frag	1	1870 Surface			
578-7	Obsidian lanceolate projectile point mid-section frag	2	1179 Surface			
578-8	Obsidian biface frag	1	1180 Surface			
578-9	Obsidian "possible crescent" frag	1	1180 Surface			
578-10	Red & black banded obsidian Humboldt concave base point	1	1180 Surface			
578-11	Large obsidian lanceolate projectile point frag (basal)	1	1180 Surface			
578-12	Obsidian biface frag	1	Isolated find Area 8 Transect #6	25m E of W boundary area 8		
578-13	Obsidian biface frag	1	Isolated find Area 8 Transect #3	175m E of W boundary		
578-14	Large obsidian serrated & stemmed point blade frag	1	1174 Surface			
578-15	Obsidian Humboldt concave base projectile point	1	1174 Surface			
578-16	Obsidian Rosegate "A" projectile point	1	1175 Surface			
578-17	Obsidian biface tip frag	1	1177 Surface			

CATALOGUE #	DESCRIPTION	QTY/WT	PROVENIENCE	COMMENTS	DATE PHOTO # COLLECTED
578-18	Obsidian Rosegate "C" projectile point	1	1873 Surface		
578-19	Obsidian "square stemmed" biface	1	1873 Surface		
578-20	Obsidian Rosegate "C" projectile point	1	1876 Surface		
578-21	Obsidian Elko-eared projectile point	1	1878 Surface		
578-22	Obsidian Rosegate "C" projectile point	1	1878 Surface		
578-23	Obsidian Rosegate "B" projectile point	1	1878 Surface		
578-24	Obsidian Rosegate "C" projectile point	1	1878 Surface		
578-25	Small obsidian Rosegate "C" projectile point	1	1878 Surface		
578-26	Vesicular Basalt Bowl Marker Rim frag	1	1878 Surface		
578-27	Small obsidian lanceolate projectile point frag	1	1181 Surface		
578-28	Large fine grained basalt point/ biface mid-section	1	1868 Surface		
578-29	Small obsidian Gatecliff split stem projectile point	1	1182 Surface		
578-30	Small obsidian Rosegate "C" projectile point	1	1869 Surface		
578-31	Small Rosegate series projectile point	1	1869 Surface	Stem missing	
578-32	Red vesicular basalt pestle mid-section frag	1	1865 Surface		
578-33	Obsidian lanceolate projectile point	1	1884 Surface		

CATALOG #	DESCRIPTION	QTY/WT	PROVENIENCE	COMMENTS	DATE PHOTO # COLLECTED
578-34	Red & Black banded obsidian triangular point frag	1	1884 Surface		
578-35	Obsidian Rosegate "B" projectile point	1	Isolated find Area A Transect #30	500m from E edge Area A	
578-36	Obsidian projectile point blade frag	1	Isolated find Area A Transect #41	150m from far E edge	
578-37	Obsidian Rosegate "C" projectile point frag	1	Isolated find Area A Transect #26	1050m from E edge	
578-38	Obsidian projectile point mid- section	1	Isolated find Area B Transect #14	150m from E edge	
578-39	Obsidian Rosegate "C" projectile point	1	Isolated find Area B Transect #37	28m W of E edge unit B	
578-40	Obsidian lanceolate projectile point	1	Isolated find Area C Transect #42	460m from W edge	
578-41	Obsidian lanceolate projectile point	1	Isolated find Area C Transect #14	20m from W boundary	
578-42	Obsidian projectile point blade	2	Isolated find Area C Transect #24	360m from W edge	
578-43	Obsidian Rosegate "C" projectile point	1	Isolated find Area D Transect #15	5m from W edge	

APPENDIX C

Persons and Agencies Contacted

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Desert Inn Motel
Christmas Lake Valley, Oregon

Appendix D has been deleted for public release of this document.