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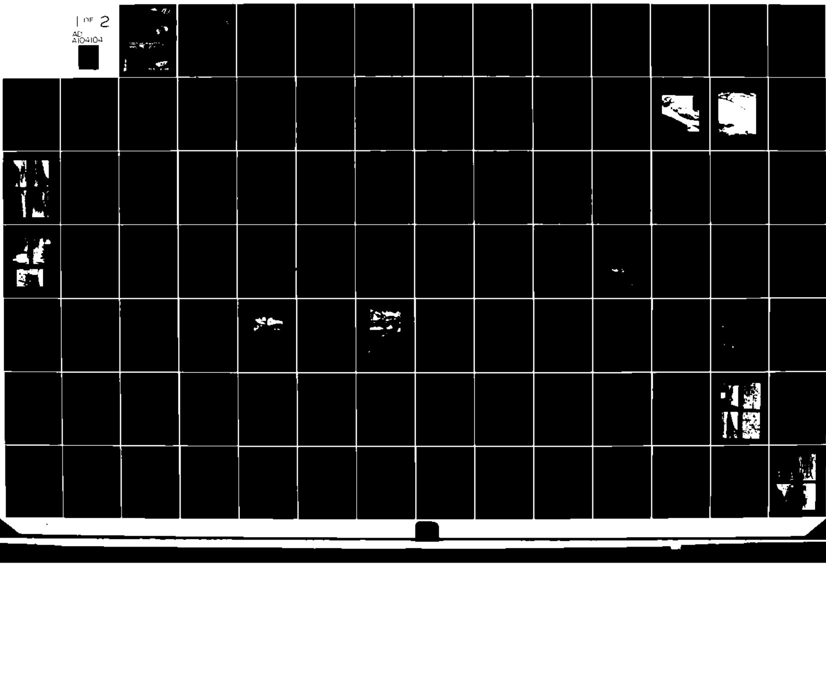

Project Report Number 10

# TEST EXCAVATIONS AT BOX CANYON AND THREE OTHER SIDE CANYON SITES IN THE McNARY RESERVOIR

by

Greg C. Burtchard

with contributions by

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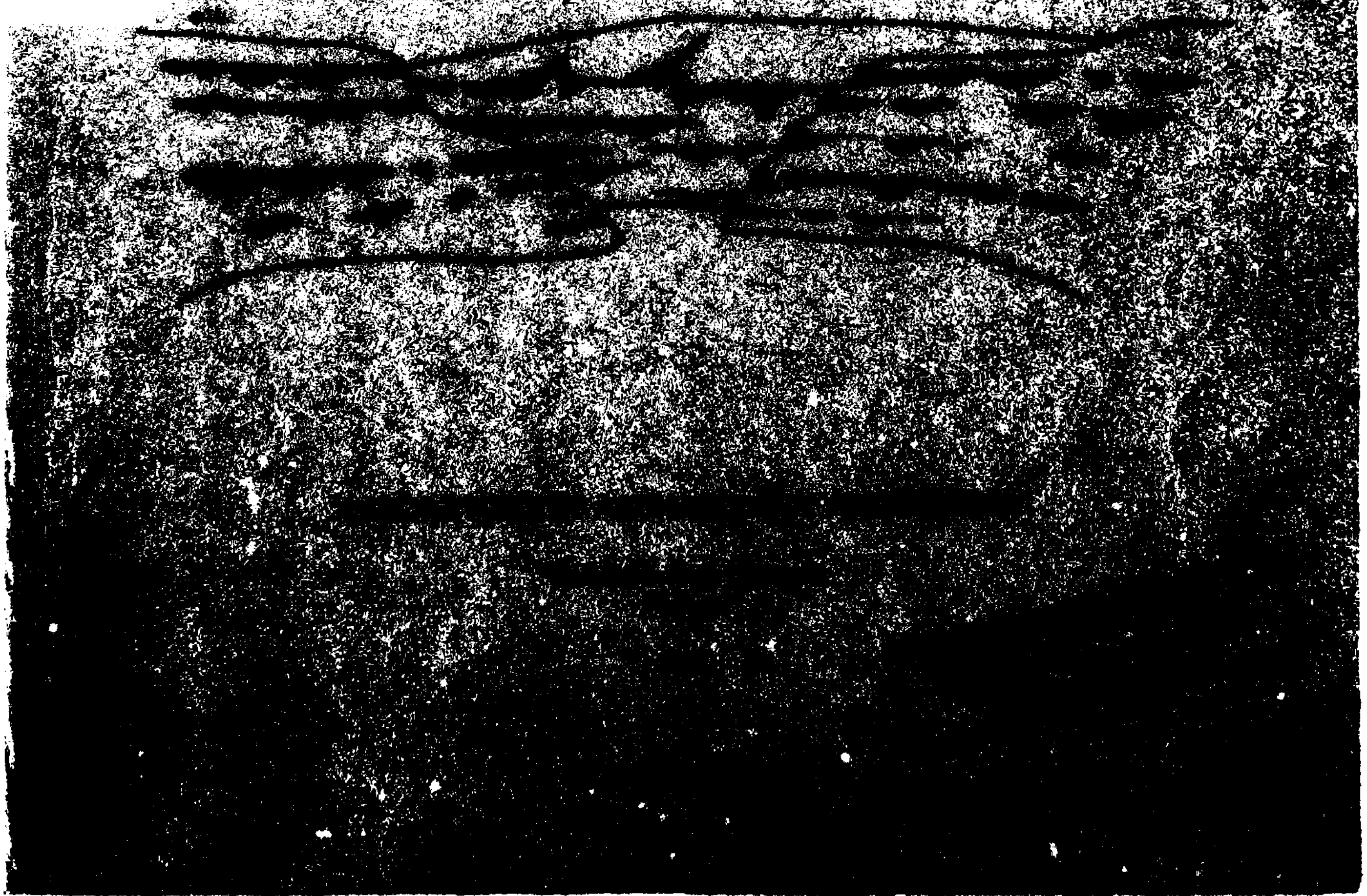

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# Test Excavations at Box Canyon and Three Other Side Canyon Sites in the McNary Reservoir

by

Greg C. Burtchard

with contributions by

Kim Simmons
Eileen Adams-Rasmussen
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Contract DACW68-79-C-0066

Laboratory of Archaeology and History

Washington State University

Pullman
1981

*The test excavations at Box Canyon and Three Other Side Canyon Sites in the McNary Reservoir were undertaken for the U.S. Army Corps of Engineers, Walla Walla District, in fulfillment of contract number DACW68-79-C-0066. All contract information is filed at the Laboratory of Archaeology and History, Washington State University, Pullman, under coding 11F-3903-0113.*



*Project Reports* is a selected series disclosing the results of research in the form of final and interim reports submitted to agencies which have contracted with the Laboratory of Archaeology and History for information on cultural resources.

# PREFACE

The Columbia River Side Canyons project was conducted for the U.S. Army Corps of Engineers, Walla Walla District. It is part of a larger project involving a completed site survey of Columbia River margins, and testing of a series of sites awarded high research priority through evaluation of data gathered in the survey. The intent of the present project was to test and evaluate four of the high priority sites. This volume is the final report of that project.

The sites investigated are Box Canyon (35UM64), an early habitation site on the southern shore of the Columbia; and three nearby canyon lithic sites (45BN187, 188, and 189) on the northern shore. All sites lie between 5-7 miles upstream from the present McNary Dam location. The sites superficially appear as lithic and shell concentrations exposed as lag deposits in deflated sand on the canyon floors. Our intent was to gather basic archaeological data relevant to horizontal and vertical site dimensions and the nature of cultural materials, and, to the extent possible, to use these data to generate statements about site function and temporal range. Ultimately, the information is used to assess site significance and to assist the Corps of Engineers in their ongoing cultural resource management program.

This report details the test procedures used, discusses the results of those procedures, and uses those results to assess site significance and develop management options. The deflated nature of the sites posed problems in developing a meaningful test strategy. Consequently, a chapter is devoted to the explanation of field techniques to allow the reader to better evaluate the data obtained. In addition, much effort has been devoted to discussion of the Columbia Basin and immediate canyon environments and their combined effects on prehistoric human adaptations in the area. It is the position taken here that human behavior and its resulting archaeologically preserved remains can best be understood by reference to the environment context. This perspective is a repeating element of the report, and underlies the interpretation of results and the research options developed in the assessment of site significance.

In my opinion, the results of the project are quite interesting. The Box Canyon Site (35UM64) contains cultural materials in clear stratigraphic context underlying Mazama Ash. As such, it represents one of the relatively few sites containing materials dating to early prehistoric use of the Plateau. In the report, I argue that the site's research value is adequate to warrant its inclusion in the National Register of Historic Places. The three northern shore sites appear to have been used for more temporary activities. I suggest use as transportation routes, hunting areas, and/or plant extraction sites. Though I do not argue for inclusion in the National Register, these sites also can be of important research value when integrated into region wide research design. I hope that the results reported here not only will assist the Corps of Engineers in the management of their cultural resources, but also will prove to be a useful addition to the archaeology of the region.

A number of persons deserve special credit for their help during various phases of the project. I wish to thank Randall Schalk, principal investigator for the project, for his advice on field procedures, critical assistance in preparation of the report, and exceptional patience throughout the effort. The field crew did an exceptional job and maintained good humor in the face of difficult weather conditions. Anyone working along the Mid-Columbia in the late autumn is aware of the finger-numbing cold that can blow up the river and through the best of clothing. Much credit goes to Kim Simmons, Nick Paglieri, and Andrew Barsotti for their efforts. Eileen Adams-Rasmussen also deserves credit for excellent lab work and for sorting the masses of material and interpreting our numb-fingered, substandard handwriting. Cathy Eshleman did a fine job in preparation of the manuscript and in interpreting my always substandard handwriting. I also wish to express my appreciation to personnel from the Corps of Engineers with whom we maintained an excellent working relationship. LeRoy Allen, archaeological coordinator for the Walla Walla District, has displayed continuing confidence in our ability to conduct the project and prepare this report. Bob Carter, chief engineer at McNary Dam, was most helpful in arranging for use of Corps of Engineer facilities. Dan Bagley, cartographer, was of great help in providing maps and areal photographs essential to the project. Finally, critical assistance with vehicles when we needed help the most came from Orville Buchanon.

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# CHAPTER 1

# INTRODUCTION

The Columbia River Side Canyon Sites superficially appear as lithic, shell and bone scatters exposed in four north to south running breaks through basalt cliff terraces adjacent to McNary Reservoir. All of the canyons are characterized to some extent by the presence of semi-stabilized and unstabilized sand dune formations. It is in deflated areas in these dunes that the sites are exposed. The constant tendency for dune movement accounts both for the initial discovery of the sites and a source of gradual site deterioration. The site locations provide a unique set of problems to field archaeology; problems that are generally avoided by archaeologists who often work at more dramatic sites in other environmental contexts. This project is an attempt to (1) develop a test strategy that would meaningfully sample the range of cultural materials at deflated sites, (2) offer information of utility for informed cultural resource management, and (3) present data for the research needs of the larger archaeological community. This report summarizes the results of the project.

## Background to the Report

The present study is part of a continuing project of site survey and testing begun in 1975. In that year, Washington Archaeological Research Center (WARC), under contract to the U.S. Army Corps of Engineers, conducted an extensive archaeological reconnaissance along the margins of the Middle Columbia, Lower Snake, and Lower Palouse River Reservoirs. The reconnaissance located 50 visible sites above the reservoir water levels. The project report (Cleveland et al. 1976) provides basic descriptive information on site morphology, and discusses current and projected states of preservation.

After evaluation of the survey data, 23 sites were selected for further examination. Priorities were established based upon state of preservation; potential contribution to knowledge of the prehistory of North America; and anticipated erosional and construction impacts. It was intended that some or all of these sites would be tested over a four-year period. The tests were to be structured in a manner that would provide a more thorough understanding of site morphology, temporal affinity, function, and significance. The tests were not to be considered mitigation, but rather were intended to provide management information for the Corps of Engineers, and basic research data for interested archaeologists.

Prior to the current study, seven sites had been examined under the program. Four sites were investigated in 1977 under the field direction of Delbert Gilbow. These included two river margin sites--35UM13 and 45BN202 (the Sturgeon Hole Site); a large village site--45FR283 (Martindale Island Site); and a cave site--45FR272 (Burr or Joe Dont Cave). Results of the project were published in the WARC reports series (see

Gilbow 1977). Gregory Cleveland directed the field project in 1978. This project tested two large open sites--45FR16 (Chiawana Complex) and 45BN161 (Bateman Island); as well as a rock shelter--45FR46 (Seed Cave) (Cleveland and Uebelacker 1980).

For the present project, it was proposed initially to field-test five sites. All four of the side canyon sites lie between two to five miles upstream from the present McNary damsite. Three of these are in adjacent canyons on the northern shore: 45BN187, 188, and 189; or Second, Third, and Fourth Canyon Sites respectively. The fourth site is on the southern shore at the mouth of Box Canyon immediately west of Oregon's Hat Rock State Park. This site has been designated 35UM64, but often will be referred to as the Box Canyon Site. Locations of the side canyon sites are illustrated on Figure I-1. The fifth site was 45BN14 (Two Rivers Site) situated on the western bank of the Columbia at its confluence with the Snake River. The Two Rivers Site is a large, open village site now heavily eroded by wave action and surging of McNary Reservoir.

It was clear after initial field inspection that budget limitations would preclude testing of all five sites. LeRoy Allen, archaeological coordinator for the Corps of Engineers' Walla Walla District, was aware of the problem and agreed to limit field testing to a manageable number. We considered it preferable to test more thoroughly a restricted sample than to examine hastily all five sites. Accordingly, we limited the focus to the four side canyon sites. Several factors indicated that the sites logically could be tested as a set. All sites appeared to be situated in highly similar environmental contexts, all appeared to exhibit similar cultural manifestations, all are located in close proximity to one another, and all are likely to be subject to similar impacts. By concentrating solely on them, we were able to apply a uniform test strategy. In addition, we could cope exclusively with problems of this seldom researched aspect of Columbia Basin prehistory.

Field procedures included collection, intensive mapping, and subsurface testing. The sites in which subsurface tests were conducted were Box Canyon on the southern shore and Third Canyon on the northern shore. Surface collections were made on all of the sites. Given the apparent similarity of physiography and cultural remains of the northern shore sites, it was felt that results from Third Canyon could be projected to the two flanking canyons. In my opinion, the results were favorable. I originally thought that similarities would extend to the southern shore site as well. As will be seen, however, Box Canyon exhibited interesting differences in the nature of the materials and probable site function.

This project and report, then, focus on the Columbia River Side Canyon Sites. Work on the Two Rivers Site was limited to field reconnaissance and mapping. The field map and descriptive information on the Two Rivers Site are included in Appendix D to assist with future management consideration of this site.

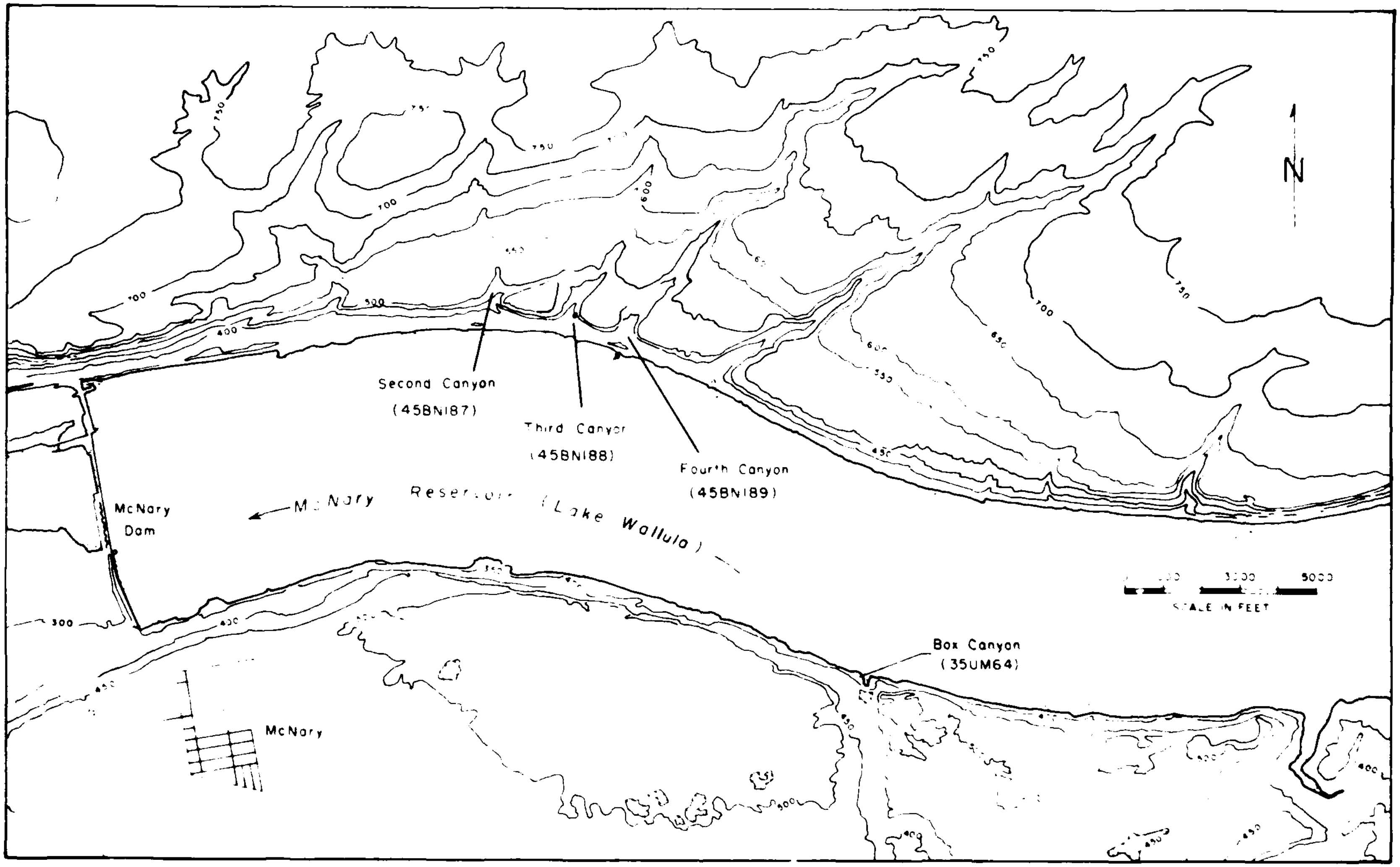



Fig. I-1. The Immediate Vicinity of the Side Canyon Sites

## Existing Research

Earliest professional archaeological research in the vicinity of the Side Canyons consists of surveys and excavations conducted by the Smithsonian Institution's River Basin Survey prior to construction of McNary Dam (see Drucker 1948, Osborne 1957, and Shiner 1961). While the early surveys failed to locate the specific sites considered in this report, they found others that provide a potentially useful comparative base for evaluating the present project's cultural remains. South shore sites of particular utility are those containing cultural materials under what is now known to be Mazama Ash. These include 35UM3, 35UM5, and 35UM8. Shiner's excavation at the Hat Creek Site--35UM5--(Shiner 1961) provides stratigraphic control on pre-Mazama materials. His tests at 35UM3 provide a second, more limited view of pre-Mazama materials. Sophisticated comparison of these materials with those from the Box Canyon site--35UM64--is hindered by differences in scale of excavation and the nature of the data sought. Nonetheless, the sheer volume of materials relating to roughly the same time frame provides a valuable supplement to data recovered by this project. Cumulatively, the four sites offer significant research potential relevant to early occupation on the Plateau. A brief comparison of materials from these sites is available in Chapter 5 of this report. I suggest that interested readers also consult Shiner's report for greater detail than can be provided here.

Most north shore sites located by the River Basin Surveys are now inundated by McNary Reservoir. None of the sites were situated directly in front of the three Side Canyons studied in this project. As a result, location cannot be used to base an argument relating materials studied by the present project to sites located by the earlier surveys. Several sites, however, were found within several miles of the Side Canyons. These include 45BN54, 45BN3--Berrian's Island, and 45BN53. Sites 45BN3 and 45BN53 were excavated and reported by Douglas Osborne (1957). Shiner (1961) also discusses materials from 45BN3. Both sites were located on Berrian's Island approximately one mile upstream from the Side Canyons. 45BN3 was a burial site, and 45BN53 was a pithouse village on the southeastern end of the island. Both sites appear to date to immediate prehistoric contact and perhaps post-contact periods. In my opinion, even though definite relationship between these sites and the three Northern Side Canyon Sites cannot be established, comparison is warranted. Projectile point varieties found in the canyons overlap those from the sites, arguing for plausible (though hardly definitive) association. I suggest later that the Side Canyons may have served as access routes between the river and exploitative areas located inland, or as hunting areas for populations settled elsewhere. The river sites are the most likely sources for these populations. Consequently, research at these sites should not be ignored when evaluating the North Shore Side Canyon sites. Again, readers should consult the original sources for more complete detail.

Archaeological research in the area has not been entirely limited to the River Basin Projects. Major projects include those downstream at Umatilla (cf. Schalk 1980), and excavations directed by Cole (1966, 1967, 1968). These projects, however, dealt with different archaeological problems than those encountered here. The sites differed in morphology, immediate environmental context, and almost certainly in activity patterns, occupation sequence, and perhaps temporal range. These studies are useful to the extent that they provide general information relevant to prehistoric human use of the area. Where data from projects such as these are useful to the present study, are suggestive of future research directions, they are cited in the text.

Work of potential utility to the present project was that conducted at 35UM13 and at Sturgeon Hole downstream from the Side Canyon Sites (see Gilbow 1978). Unfortunately, in their test program the field team was unable to relocate 35UM13, and their limited tests at Sturgeon Hole produced no cultural materials. The sites may be submerged under the easternmost end of the John Day Reservoir, and/or may reflect the limited use pattern common to the northern shore sites (see Chapter 5). In any case, data were not made available for these two small sites, and consequently could not be used for this report.

The only research directly relevant to the Side Canyon Sites is information reported by the survey that located them (Cleveland et al. 1976). The report provides brief descriptive information about the sites. The three northern sites were tentatively identified as small campsite areas situated in active sand dunes. Observed cultural materials consisted of cryptocrystalline debitage, fire cracked rock, and other assorted lithic debris exposed in deflated areas. In the middle canyon (Site 45BN188), a milling stone and cobble biface were found associated with what appeared to be circular enclosures of subangular basalt cobbles. The presence of the possible structures, coupled with continued wind erosion and accelerating use of the side canyons for pump station projects, encouraged the research team to recommend a relatively high priority for further archaeological evaluation of the sites.

The Box Canyon Site on the southern shoreline is located on a low basalt bluff terrace adjacent to the present cove-like entrance to the canyon. The field crew observed cryptocrystalline debitage, cobble cores, and a relatively dense accumulation of shell and weathered bone in deflated dune areas. The plausible association of these materials with visible volcanic ash deposits and old dune structures implied relatively great antiquity for the site. Once again, the site was tentatively identified as a campsite. Its priority rested on its possible antiquity and continuing loss to wind erosion.

## Project Objectives

Our primary purpose in testing the Side Canyon Sites was to gather basic archaeological data to assist management, and to provide for development of realistic research designs if future mitigation proved necessary. The initial surface reconnaissance could provide little more than informed speculation about site morphology and function. Our objectives were to gather data on site size both in terms of horizontal space, and depth and stratigraphic structure of deposits; to determine the state of site integrity; and to examine the character, relative frequency and patterning of cultural materials. It is our opinion that these are the categories of data needed to generate functional inferences, and to assess the scientific significance of the sites.

Perhaps our greatest obstacle was simply to realize the objectives for sites situated, as they were, in active dune systems. "Blowout archaeology" may be less than a common term in the literature, but this environmental context nonetheless poses interesting problems to site testing and excavation. A related objective, then, was to develop a test strategy that would provide meaningful results given the realities of the field situation.

It should be noted that the project does not constitute mitigation of the Side Canyon Sites, and this report should not be taken as such. I have attempted to be as thorough as possible given the limitations of sand and a small budget. In this report, I hope to offer information that will stand as a non-trivial addition to the archaeology of the Columbia Plateau. However, the work remains a test project with the limitations attendant thereto (i.e., small sample size, dispersed sample units, and the like). If terrain disturbing construction is proposed, appropriate mitigation measures should not be overlooked.

# CHAPTER 2

## ENVIRONMENTAL BACKGROUND

The four Columbia River Side Canyons of concern to this study are situated within the semi-arid Columbia Basin[1] geological/environmental regime. In a general sense, environmental processes characteristic to the region have influenced both the physical nature of the canyons and the human uses to which they have been put. More specifically, the canyon environments bear direct influence on modes of human activity in them, on the structure of artifact deposition, and on the erosional-natural depositional cycles that affect present site appearance. Furthermore, the recent filling of McNary Reservoir has altered the relationship of the canyons to the river in a manner that affects the exposure of cultural materials, and to some extent, interpretation of these materials. Consequently, it is important to gain a basic knowledge of the environments of the region and canyons in order to better understand the nature of the cultural materials that they presently contain. This chapter offers a brief introduction to the general environment of the region and a description of immediate environment of the side canyons. The intent is to convey an understanding of present conditions that characterize the canyons, to contrast this with conditions that likely held in the past, and to make the description relevant to human use of the canyons and integrity of the involved archaeological record.

In discussing the environment of the Columbia Basin, I have made little attempt to enumerate individual floral and faunal species, or to precisely describe local-level climatic or geophysical variations. My intention is to build a general understanding of the environmental factors that distinguish the Basin as a region and to elucidate the causal connections between them. These factors set the general context to which human social groups must adapt.

### Physiography

The Basin is roughly bounded by the Cascade Mountains on the west, the Okanogan Highlands on the north, the Idaho Rockies on the east, and the Blue Mountains to the southeast and south. Within the Basin, local variability is evidenced by such sub-regional distinctions as Washington's channeled scablands, Palouse Hills, Central Plains, Yakima Folds, and the Deschutes-Umatilla Plateau of Oregon and Southern Washington (see Highsmith 1973:34). Within these subregions, even finer distinctions may be made. I do so below only in describing the Columbia River Side Canyons (arguably situated at the terminus of the Deschutes-Umatilla Plateau), and the Yakima Folds. However, overall characteristics of the greater region allow consideration as a unit when compared with its upland margins. This is the unit discussed below.

The overriding characteristics that distinguish the Columbia Basin as a region are its geophysical relationship to the mountains, a rough similarity in climatic pattern, and a corresponding similarity of dominant vegetation. Geological processes that formed the surrounding mountains were varied. Here, we are concerned primarily with the fact that these processes cumulatively resulted in an enclosed, depressed geophysical region. The most recent building events were the formation of the Cascades and Cascade volcanoes during the late Pliocene and Pleistocene (Baldwin 1976). These events essentially completed the upland ring that bounds the lower lying Columbia Basin interior. The massive Cordilleran ice sheets of the Pleistocene modified the structure of both the Basin and northern mountains but failed to alter the basic basin/mountain relationship set by the Plio-Pleistocene. The general basin/mountain structure is illustrated on Figure II-1.

## Climate

The basin and mountain relationship, particularly in regard to the high Cascades, is a major determinant of the Basin's climate. Aside from the lower coastal ranges, the Cascades form the first major barrier to intercept the westerly winds blowing across the Pacific at this latitude. As winter approaches, the oceans cool more slowly than the continent. The winds pick up heat and moisture from the ocean. In late autumn and winter, much of the heat and moisture is released as the Pacific westerlies strike the colder continent. The winds are cooled further by adiabatic processes[2] as they are pushed first over the Coastal and then over the Cascade Mountains. The additional cooling results in even greater rain and snow release in and west of the Cascades. However, as the winds descend into the Columbia Basin, adiabatic warming occurs, and the water holding capacity of the air increases depriving the eastern areas from comparable rainfall. The overall result is the creation of a rain shadow effect east of the Cascades. The decreasing rainfall roughly reflects the structure of the Basin. Generally, the further the air descends, the further the precipitation declines. Accordingly, the interior of the basin remains relatively drier than its upland margins. As the winds proceed east and again rise over the Basin's eastern mountain border, they again drop moisture terminating the semi-arid climatic regime for this region.

In general then, the Columbia Basin receives only a fraction of the moisture that blankets the coast. The driest portions of the Basin, including the area of the four Side Canyon Sites, generally receives less than twelve inches annually. Most of the Basin's moisture falls in the period from late fall to early spring. Sixty percent of the annual precipitation typically falls between November and March (Pacific Northwest River Basin Commission 1970:547). The precipitation comes from remnant moisture retained beyond the Cascades. Latitudinal cooling of the inland landmass offsets much of the adiabatic warming. Consequently, a portion of the surviving moisture is released into the Basin. The wet period extends into the spring when warming temperatures, in effect "turn off the water," as will be seen below.

Not only do the winter westerlies provide a fraction of their moisture to the Basin, they provide a fraction of their warmth as well.

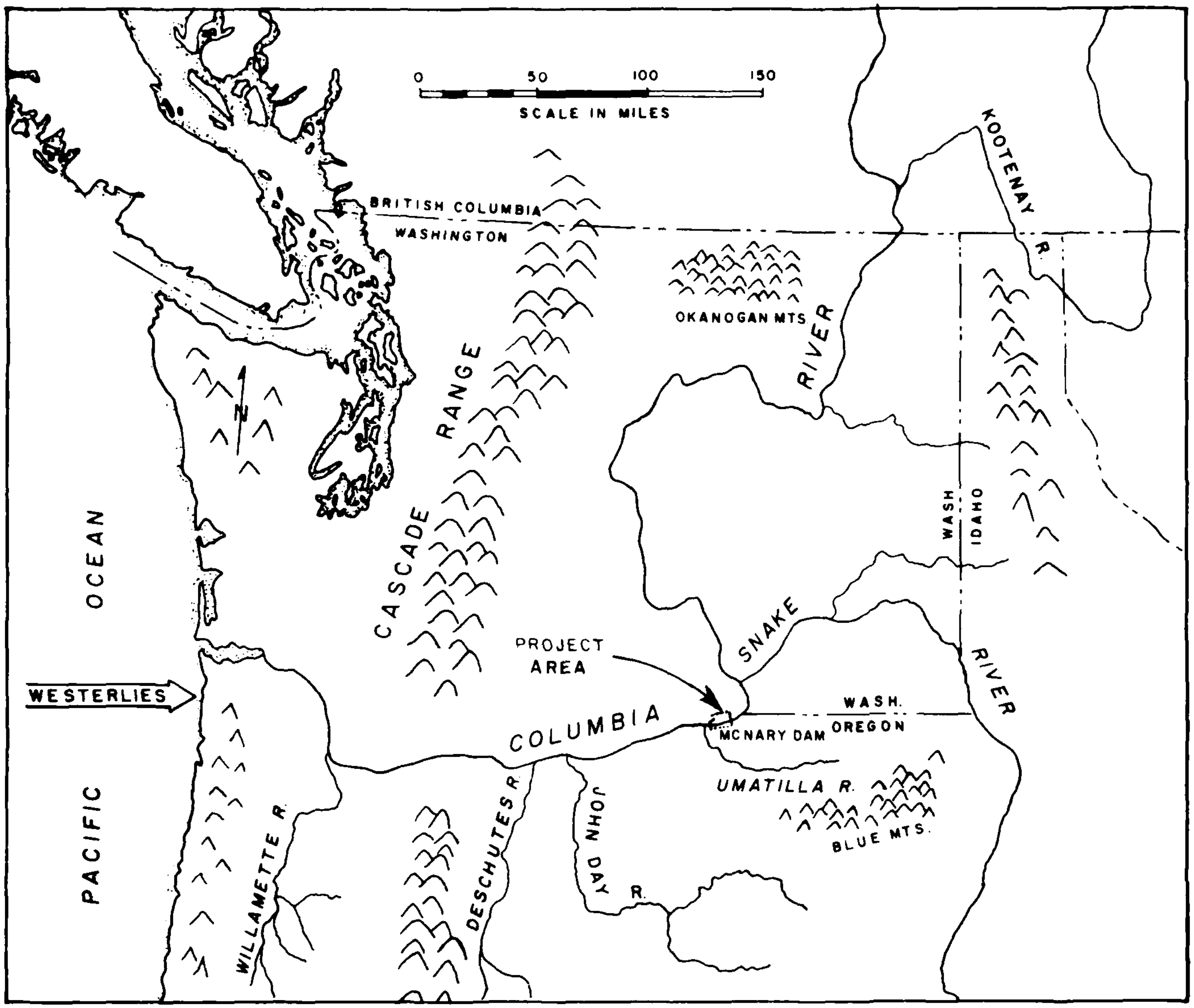



Fig. II-1. The Columbia Basin

Even though the winds lose most of their warming effect at the coast, the air retains enough heat to warm the Basin more than occurs further inland at this latitude. The climate, while cold in winter, does not pose the formidable winter obstacles of a fully continental temperature regime.

Late spring, summer and early autumn are dry periods throughout the northwest. Due to the relatively high specific heat of water, the hemispheric tilt back toward the sun warms the land masses more quickly than the oceans. As a result, the Pacific westerlies blow over terrain that is relatively warmer than the water. The moisture holding capacity of the air increases, and the rains generally do not fall. Indeed, the land masses may at times forfeit ground water to the air. Such moisture, in turn, is dropped again beyond the Basin to the east. Summer aridity, then, is the general rule across the Basin.

Summer heat has a marked effect on wind patterns in the Basin. During the season, the Pacific westerlies exert a cooling effect west of the Cascades. Inland, in the Basin, diurnal temperatures exceed those of the coast. Hot, rising air masses create a pressure differential between Basin and Coast that literally sucks air over the Cascades and through the Columbia Gorge. The resulting east-blowing, daytime winds can be quite high. The winds may be particularly severe along the Columbia River and are a major cause of the dune structure in this project's four Side Canyons. Marked nocturnal temperature decline generally halts the winds. In fact, air flow may reverse and drain toward the west. However, it does so with less force than characterizes the daytime winds.

Normally then, Columbia Basin summers are hot in the daytime, windy and dry throughout. In the winter, the Basin is colder, less dry, and less windy. Spring and autumn are intermediate. The overall effect is a semi-arid climate, with a winter dominant moisture pattern, and slightly moderated winter temperatures. Of course local variations occur. Such a general scheme cannot hold precisely for so large an area. Nonetheless, at a broad level it is possible to distinguish the climate of the Columbia Basin from that of other areas in the Northwest. Ultimately, the dominant climate results from the geophysical structure of the Basin, particularly in relation to the Cascades, its latitude, and its position relative to the Pacific Ocean.

## Vegetation

The vegetation patterns conform to that expected for the semi-arid regime described above. Dominant assemblages vary primarily as a response to altitude-related changes in precipitation. These are thoroughly described in Franklin and Dyrness (1967) and Daubenmire (1970). The general pattern displays a shift from relatively xeric to more mesic floral assemblages along an elevational gradient from the lowlands into the highlands at the Basin margins. The communities can be divided in a number of ways depending on the interests of the observer. For purposes here, a four-part division focusing on a gross ground-cover characteristic should suffice. These are adapted from Schalk's (1980) vegetation summary on the Deschutes-Umatilla Plateau. In the Basin, vegetation ranges from (1) shrub steppe, dominated by big sage and widely spaced grasses; to (2) steppe, more thoroughly dominated by grass cover; to (3) open forest of Juniper and Ponderosa Pine; to (4) relatively closed canopy forests of Grand Fir and Douglas Fir. The assemblages occur roughly along elevational gradients with some assemblages intruding into lower zones at places where water courses compensate for the otherwise limiting rainfall.

Questions may arise concerning the extent of historic modifications of the floral zones and the stability of the pattern through time. The introduction of domestic animals, exotic plant species, cultivation, irrigation, forest management, and the like certainly have combined to affect the Basin's vegetational patterns. Such impacts, however, are likely to have had little effect at the broad scale used here. Furthermore, it is not unlikely that the gross pattern has held more or less stable throughout the period of human occupation of the Basin. The vegetational pattern reflects a causal relationship between the geophysical structure of the Basin and Cascades, and the Basin's climate. Except for periods of massive climatic perturbations, like those of the Pleistocene glaciations, and some more limited changes, the Basin's climate should have remained relatively stable since basin/mountain formation. This is particularly likely for the relatively brief period of human occupation.[3] For purposes here, then, the basic vegetational pattern presently characterizing the Basin is assumed to hold for the past as well as for the present.

## Fauna

Distribution and migration patterns of mammalian and riverine fauna relevant to the Basin are well summarized by Schalk (1980). Below, I have further reduced and modified the summary to provide a basic notion about faunal patterns characteristic of the Basin. Mammals and fish are stressed since these are major exploitable human reources.

Mammalian fauna in the Basin is distributed roughly in accordance with vegetative structures. This is hardly surprising since secondary consumers rely on primary floral productivity for food sources. Herbivores range the Basin in accordance with abundance and seasonal variation in assimilable energy sources. Within the shrub-steppe and steppe zones, there was probably little difference in overall species representation, though density was probably higher in the latter. Small mammals primarily include rabbits, skunks, and mice. Of these, only rabbits appear to be a significant food resource. Large ungulates include mule deer and pronghorn antelope, bison, elk, and some bighorn sheep. The horse was introduced in the 18th century and apparently adapted well to the grassy steppes in late prehistoric and historic times. The extent to which the steppe's large ungulate species were a major food source for prehistoric humans is uncertain. Schalk (1980:16) speculates that densities of the two main, non-migratory species in the central part of the Basin (mule deer and antelope) were quite low. If so, the steppes *per se* may not have been a major exploitative zone for prehistoric humans. Humans may have exploited them expediently or when seasonal densities were high, while relying primarily on the open forests and forest grassland margins where species distribution and abundance may have been consistently greater; or on more productive, spatially isolated zones within them. Schalk (ibid.) summarizes the forest ecology of the major herbivores.

> Moving upslope into the ponderosa forests, mule deer remain a component of the herbivore assemblage and presumably were in the past. Antelope too may well have extended at one time into the lower edge of this open forest. In any case, it is clear that the elk (*Cervus canadensis*) and the white-tailed deer join the faunal assemblage in this zone. Because of winter severity and the depth of snowfall at this elevation, ungulates present in this zone all apparently migrate upslope in summer and downslope in winter.
>
> Elk habitat preference is probably for the characteristically open ponderosa forests but this species also makes use of mountain meadows even above timberline. The white-tailed deer (*O. virgianus*) is apparently adapted to denser forests than the mule deer or even the elk and would be expected to be most abundant somewhat above these other ungulates.

Perhaps the single most significant resource-related environmental feature altering the Basin as pictured above is the Columbia River network. The Columbia and its major tributaries provide major habitats that would generally not be expected on similar scale in a semi-arid environment. The riparian habitat supports fish, shell fish, water and land fowl, and a relatively high density of small mammals. We could also expect increased large mammal faunal density along the relatively diverse river banks. Of paramount importance, however, was the high density of anadromous fish. Salmon and steelhead trout have provided major food resources for human populations well into the prehistoric past. Along the Columbia, Chinook salmon is the most abundant. This species runs from spring through fall. Other anadromous species generally run during the same period.[4] Assuming an ability to exploit them, the importance of fish resources is great indeed. The Columbia, and to a lesser extent its tributaries, offered a spatially concentrated, seasonally abundant source of assimilable energy that could only have a marked impact on human use of the region.

The Columbia River network, then, provided a highly concentrated subsistence resource in the midst of an otherwise relatively resource-sparce, semi-arid Basin. The seasonal productivity of the rivers was quite high and year-round resources were generally more abundant than the immediate surroundings. The resource capacity of the Basin terrain, particularly the margins, however, was not negligible. The Basin's terrestrial and riparian ecosystems combined to form an overall environmental context to which human groups have been obliged to adapt. It remains to be seen how the Columbia River Side Canyons fit within the general environmental pattern.

## The Columbia River Side Canyons

The Side Canyons are situated in the most arid, shrub-steppe portion of the Columbia Basin. Their position relative to the river, however, places them at the shrub-steppe/riparian margin. At present, all of the Side Canyon mouths are within a few hundred meters of the river. Prior to the filling of McNary Reservoir, however, the situation was quite different. The northern shore canyons were located well back from the water. A gently sloping flood plain separated the river and canyons by about 900 meters. Figures II-2 and II-3 clearly illustrate the change. Box Canyon is at the lower right on the southern shore. Second, Third, and Fourth Canyons are the westernmost three canyons on the northern shore. The past relative position of canyons and water undoubtedly affected prehistoric deposition patterns, and present conditions affect site integrity. It should be borne in mind that the following descriptions are of the canyons as they presently appear. The basic physiographic structure of the canyons is probably little changed, but the relevance of this structure to human use is probably not the same as in the past. Where possible, I have noted deviations from past conditions and discuss implications that these hold for interpretation of the archaeological record.

All four of the canyons studied are roughly similar in formative processes and appearance. They differ in total length and breadth, and present relationship to the river. All of the canyons form breaks in the terraces and basalt cliffs that border this portion of the river from Wallula Gap to McNary Dam. The canyons were formed by water erosion during the melting of the Cordilleran ice sheet. The series of Spokane floods, especially the most impressive "Missoula Flood," stemming from the breakdown of inland ice dams, washed over the terrace tops and back into the Columbia at a number of points. Canyons were cut at weak points in the basalt. Resulting breaks include the four canyons under study. None of the canyons are subject to water erosion at this present time. It is probable that fluvial formative processes were temporally limited and that subsequent water erosion has been limited to infrequent flooding. Since their formation, the canyons primarily have been affected by aeolian processes. Winds have deposited sand and volcanic materials and continue to rearrange them with the dune formations that appear today.

Box Canyon is the only site studied on the southern shore. It is a large break in a two-level basalt cliff/terrace structure. The relationship of the canyon to its surrounding terrain can be seen easily on the aerial photographs (Figures II-2 and II-3 and in Figure I-1). The canyon terminates abruptly with the lowest basalt cliff at the river's edge. At Box Canyon, the relative position of terrain to water does not appear to have changed significantly with the filling of McNary Reservoir.

Inland from Box Canyon lies the rolling plain of the Deschutes-Umatilla Plateau. The land is now used extensively for irrigated agriculture and stock raising. Military storage facilities, towns, and roads are scattered across the area. In the past, the area would have appeared primarily as grass covered steppe. However, deeply incised canyons with temporary and permanent water courses crosscut the landscape. These are

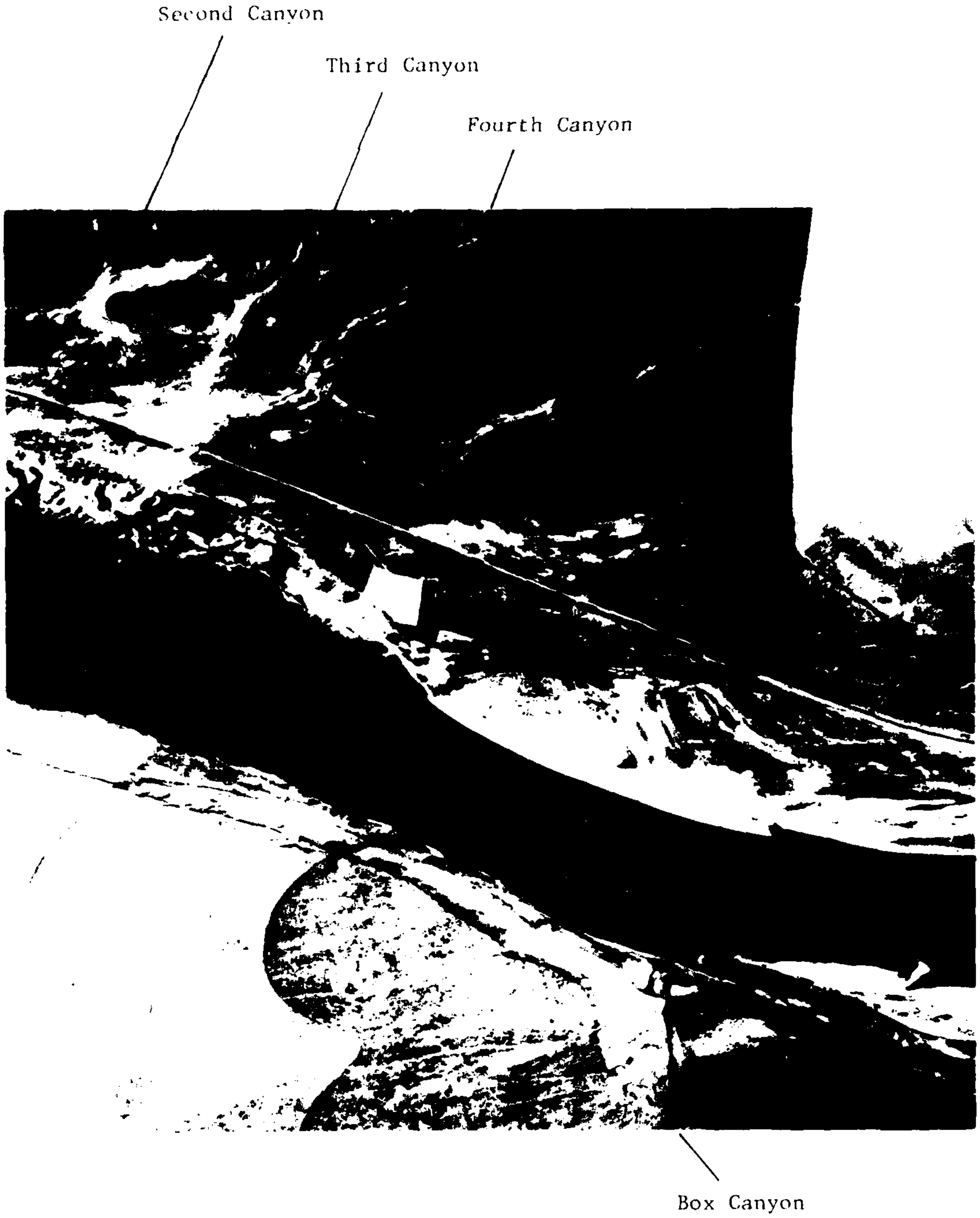



Fig. II-2. Columbia River and Side Canyons Prior to McNary Dam
(1944 Photo: Courtesy of U.S. Army Corps of Engineers)


Fig. II-3. Columbia River and Side Canyons After McNary Dam
(1976 Photo: Courtesy of U.S. Army Corps of Engineers)

particularly prevalent to the southeast in the general direction of Pendleton. Such terrain features may have provided adequate habitat variability to raise the support capacity of the region beyond that which would be indicated by a simple shrub steppe/steppe dichotomy. The Blue Mountains located approximately 45 miles to the east-southeast offered their characteristic resources to highly mobile hunters. The relationship of these potential resource areas to riverine sites is as yet highly speculative and beyond the purpose of this report. However, in my opinion, it is most likely that the riverine sites, particularly early sites, cannot be fully understood without considering the broader resource gathering region in which they occur. Due to the nature of funding, most archaeological research has been focused on the river. This project is no exception, but I would hope that future work will be able to consider more fully the broader environmental context of sites like Box Canyon.

Vegetation in the immediate vicinity of the canyon is characteristic of the shrub steppe assemblage. Big sage is profuse and mixed with widely spaced bunch grasses and the now ubiquitous cheat grass. Soils are sandy and thin. Sub-angular basalt cobbles frequently are exposed on the surface indicating the shallow depth of the soils on the terraces. Nonetheless, terrace vegetation appears to be stabilized at present. Duning and deflation activity is limited to the canyon interior. A series of deflated areas begin immediately south of the roadbed up the canyon. These were present in 1944, but appear to have become more extensive since that time.

The bulk of the cultural materials at Box Canyon appear to be limited to the western side of the canyon mouth on a triangular extension of the lowest terrace. The immediate site area is pictured in Figure II-4. It is characterized by semi-stabilized and unstabilized dunes that extend outward to the cliff edge (now the water edge). The site is exposed at various points in the deflated dune sediments. The contours on Figure III-1 provide a view of site morphology and its relationship to surface cultural debris.

A noteworthy geological feature is the presence of a thick, primary deposit of volcanic ash. It is exposed at the wind eroded tip of the terrace. The ash is overlain by recent dune activity; and it in turn, lies above still older dune formations. The deposit's importance to the site is particularly great, since it was found to overly cultural materials from the older dunes. It provides one part of a temporal framework arguing for early habitation of the Box Canyon Site. Site sediments and the tephra deposit are discussed more thoroughly in Chapter 5, and in Appendices B and C of this report.

Historic environmental impacts to the site's environment appear to be limited to the heightened water level of McNary Reservoir and to construction of a raised railroad (later automobile) bed across the canyon. As mentioned above, McNary Reservoir does not appear to have seriously affected site integrity. The river appears to have run directly under the terrace cliff for some time. Owing to the cliff, the reservoir has raised the water level but has not inundated or eroded the site.

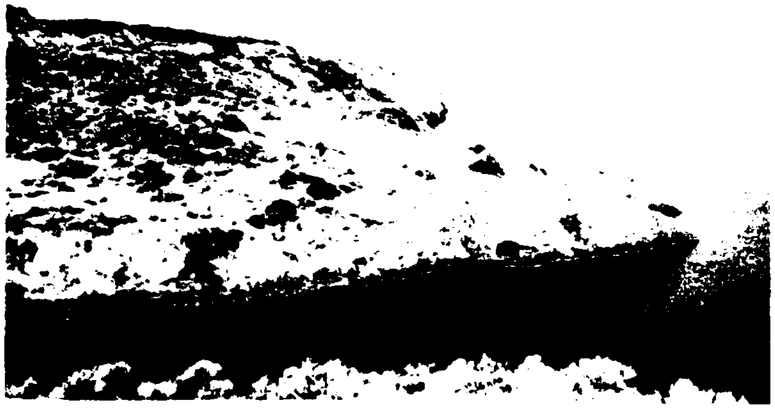


Fig. II-4. Box Canyon Site (35UM64) Facing West

Fig. II-5. View Facing North into the Mouth of Second Canyon (45BN187)

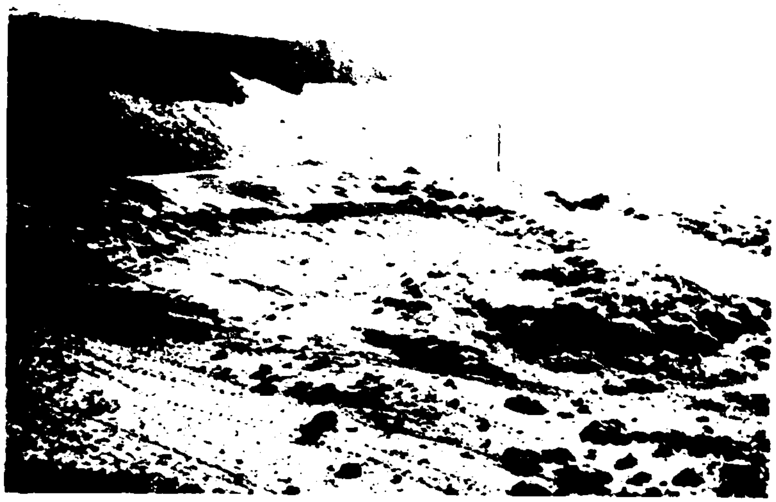


Fig. II-6. View of Third Canyon and Remnant Flood-plain Looking East. Note Dune Formation Near Canyon Wall.

Fig. II-7. Fourth Canyon (45BN189) Facing West. The Entrance at Third Canyon (45BN188) is Visible at Upper Left.

Similarly, the roadbed appears to have narrowly missed the site to the south. Earth fill used to build the roadbed was taken from the now deflated pit south of the road. There is no evidence of cultural material in the vicinity of the barrow pit. The site appears to center near the terrace tip and end in the vicinity of the roadbeds. Road fill materials appear to contribute to the overburden of part of the site, but construction did not remove the site per se.

In sum, the Box Canyon Site is situated on a terrace tip at the mouth of Box Canyon. Its immediately available vegetative and resource zones consist of riverine, shrub steppe, and steep assemblages. More productive terrestrial zones were available inland; and, to an unknown extent, may have formed a part of the past effective resource environment of the site. The site itself is situated in and under semi-stabilized and unstabilized dunes. Presently, the site is eroded by wind activity; but it does not appear to have been harmed severely by construction, nor has site integrity been altered significantly by the presence of McNary Reservoir. As a result, the Box Canyon site may still offer the possibility of further study within a reasonable semblance of its original environmental context.

The three northern shore sites are in canyons cut through a single basalt cliff and terrace. The primary physiographic differences with one another are limited to variations in length and width. Because of their overriding similarity of form, close proximity, and similar position relative to the river, a generalized or composite description will be provided here. The differences that exist may be seen by comparing the variety of photographs and maps that illustrate the canyons.

The terrain from the terrace tops north to the Horse Heaven Hills is a rising grass covered steppe. Access to more varied resource zones ultimately are available to the north and west, but the distances are greater than across the Columbia to the southeast. Vegetation within and below the canyons retains most of the characteristics of that on the southern shore. The interior of the canyons and remnant floodplain below the terrace cliff is covered with big sage and bunch grasses. To these are added waist high dune grasses, and cattails. Other marsh vegetation occurs near the water. Figure II-5, 6, and 7 illustrate typical autumn vegetation and dune formation in the canyons.

Dune/deflation activity is particularly active within and in front of the canyons. Photographs and maps clearly indicate the formations. Perhaps the most salient characteristic of the dunes is the sand arc formed at the eastern margin of each canyon (see Figure II-3). Prevailing summer westerlies deposit the sands in thin patterns at the mouths of the canyons where the cliff faces obstruct air flow. General turbulence in the canyons maintains unstabilized sands. particularly in the eastern margins. As with Box Canyon, aerial photographs indicate that similar conditions existed at least as early as 1944 but may have become more severe through time. The rate of dune development and the resulting change in the patterns of dunes and blow-outs has not been established. Since exposure of cultural material is determined largely by this process, dune movement is a significant factor affecting site exposure and integrity.

The contour map of Second Canyon (Figure III-6) was prepared, in part, to illustrate present dune structure and to provide a point from which to judge subsequent dune movement. Such monitoring is suggested in Chapter 7 of this report.

In front of Fourth Canyon is a triangular shaped land parcel extending into McNary Reservoir. It is visible at the upper right of Figure II-6. It is the site of unusually dense vegetation for the area. Russian Olive is now particularly profuse. The vegetation provides a particularly varied wildlife habitat. Small mammals, pheasant, and waterfowl are relatively abundant. The extent to which such vegetative enclaves would have applied to the prehistoric shoreline is uncertain. Russian Olives, of course, were introduced much later. It is likely, however, that ecologically diverse pockets, not unlike that at the mouth of Fourth Canyon, existed at high points on the floodplain. If so, relatively productive zones for exploiting riverine flora and fauna would have existed several hundred meters in front of the canyons. Human use of such resources may have been focused more in front of the canyons than in the canyons proper. Unfortunately, the area is now under water, and we are left with the present configuration of canyons and river.

The original distance from the canyons to the river affects the nature of cultural materials that may be expected to occur in them. The relative paucity of debris in comparison to Box Canyon, for example, may reflect the variation on the position of canyons to available resources and consequent difference in activities in the canyons. As a result, the evaluation of the northern shore sites must consider the altered environmental context of the northern canyons and their position relative to known prehistoric habitations.

Sediments in the canyons are similar to those for Box Canyon. Aeolian deposits of sand and volcanic ash are prevalent. Deposits are thin on the terrace tops and canyon sides exposed to wind scouring. They increase in thickness toward the canyon centers and with the dunes at the western margins. The volcanic ash is present throughout the length of the canyons. All tephra deposits appear to have been reworked, depriving us of the neat temporal referent available in Box Canyon. Reference should be made to Chapter 4 and Appendix B for more detailed discussion of soil profiles.

Historic modifications of the north shore canyon environment to date consisted of changing water level, rail and road construction, power line construction, and grazing. The impact of McNary Reservoir has already been mentioned. Rails, roads, and power lines have all been placed in front of the canyons (see Figure II-6). Since these represent relatively limited linear or spot intrusions on the terrain, their combined impact on site integrity is probably not great. Grazing and vehicle use in the canyons has contributed to defoliation and increased wind erosion. Of the historic modification, the filling of McNary Reservoir is by far the most significant for interpreting cultural remains. It will be considered again in Chapters 5 and 6 of this report. Potential future impact of irrigation pump station facilities are discussed in Chapter 7.

The Northern Shore sites share the same general riverine/shrub steppe to steppe environment of Box Canyon. They differ from Box Canyon most notably in their immediate relation to prehistoric riverine resources. While Box Canyon was located immediately adjacent to the Columbia, the northern shore canyons were nearly a kilometer removed. These environmental differences may have contributed directly to different intensities of activity, and subsequently on the probability of identifiable site loci, between the two sides. The northern canyons may have been better suited to more ephemeral uses as temporary camps and inland travel routes than to longer-term sites that would leave more concentrated cultural remains. Higher levels of cultural activity may have concentrated closer to the river. Riverside remains are now lost on the northern shore; but, as will be seen later, the nature of artifact distribution in the canyons plausibly reflects a pattern expected by primary riverbank use.

## Summary Implications

Environmental relevance to human exploitation of the Columbia Basin and its riverine environments have been noted intermittently above. Here I wish to pull together some of the most basic implications that these environmental parameters pose for prehistoric use of the Side Canyons. A more sophisticated statement on the relationship of Basin/ Side Canyon ecology to patterns of human occupation would be interesting, but far exceeds the limitations of this report. Indeed, such an attempt exceeds presently available data; and perhaps, present theoretical interpretive frameworks as well. Nonetheless, certain implications can be drawn that may help us interpret the nature of cultural material in the Side Canyons.

The basic environmental patterns that characterize the Columbia Basin affect the nature of resources amenable to sustained exploitation by human groups. At its most general level, the pattern is one in which exploitable resources are concentrated at spatially limited, primarily riverine, locations in the Basin interior; are intermittently available at low densities across most of the interior terrain; and are available at relatively higher densities at the Basin margins. In other words, the rivers and forested Basin margins are the most productive zones, and are separated by the less productive steppe interior. The four Columbia River Side Canyons are situated at the interface between interior riverine and terrestrial "zones." Assuming that prehistoric groups tended to concentrate their activities on the most productive resources, use of the canyons was plausibly incidental to the exploitation of riverine and Basin margin resources. The Side Canyons themselves are too small and dry to have offered unique resources adequate for sustained independent exploitation. In my opinion, then, the canyons most plausibly were significant as (1) shelter locations from the more exposed floodplain and terrace tops; (2) access routes through the basalt cliff barrier separating this portion of the floodplain from the Basin margins; and (3) temporary use areas for hunting and/or plant collection. Given similarity in canyon structure, the importance of the first possibility may vary as a direct function of distance from the river. The importance of the second and third is a function of the abundance of terrestrial resources that would have been accessed through them or found within them.

Superficially, these implications seem to hold. Box Canyon, with its close proximity to the river is the only site providing clear evidence of habitation sites. The northern shore canyons contain cultural materials scattered throughout their length in a manner that suggests repeated ephemeral use and/or use as a transportation route between river and basin. It must be emphasized that these patterns are not clear-cut, and that the present study does not constitute a test of the propositions. However, the manner in which resources are distributed across the Basin must affect the distributions, mobility and exploitative strategies of groups dependent on them. The four Columbia River Side Canyons fit within that context in a manner that suggest certain constraints on their prehistoric use. I suggest that the implications drawn here conform to those constraints and provide an adequate interpretive base for which to begin examining the results of the field project.

## NOTES

1. I have chosen to use the term Columbia Basin to reflect the geological relationship of the region described here with its surrounding mountainous margins. The region approximates the area variously referred to as the Columbia Plateau, Columbia Plains, and Inland Empire among others.

2. Adiabatic lapse rate, as it is used here, refers to the tendency of a volume of air to cool as it expands and warm as it is compressed. As air moves up and over major landforms, it will cool at a rate of $3^{o}C$ per 1,000 feet strictly from expansion. It warms at the same rate as it descends. The cooling and warming in turn affects its ability to retain or absorb moisture. This process and other broad-scale climatic determinants are introduced by Eric Pianka (1974:21-41) in his excellent text on evolutionary ecology.

3. I maintain here that long term climatic change is inadequate to explain changing modes of human adaptation in the Basin. I am aware of post-glacial environmental change and its supposed effect on human adaptation. It seems unlikely that changes would have been adequate to significantly alter the broad-scale vegetational and faunal patterns described here. In the absence of mechanisms to explain the effect of environmental changes on the involved human systems, archaeologists might be better served to concentrate on the relationship between population growth and resource balance to explain culture change rather than on simple environmental (climatic) change and culture change.

4. For a thorough coverage of the cultural significance of anadromous fish in the Pacific Northwest, I recommend that the reader consult Randall Schalk's (1977 and 1978) work in this area.

# CHAPTER 3

## FIELD TECHNIQUES

Prior to the present project, specific information on the Side Canyon Sites was limited to that obtained by the 1975 river reconnaissance. Because of the scope of that undertaking, recorded information was limited to a general indication of site location, description of readily visible cultural debris and site morphology, and possible site function. The surveyors noted the profuse debris at Box Canyon and the presence of volcanic ash; and tentatively identified structural remains in Third Canyon (see Cleveland et al. 1976:21-24). Based on the reconnaissance information, the sites were judged to warrant a second phase of investigation. The present project is that second phase. Our intent on this project has been to obtain information that will facilitate more accurate evaluation of the nature and significance of the sites. The investigation was not intended to constitute site mitigation but rather basic data collection necessary for adequate management of the cultural resources.

Field procedures were designated to (1) derive samples representative of the range of cultural materials at the site, (2) relate those materials to natural strata in the canyons, (3) accurately record site morphology, and (4) establish vertical and horizontal site boundaries. Throughout the project, we were forced to adapt procedures to the dune/deflation context of the Side Canyons. This context was a particular concern because of its tendency to obscure the relationship between surface material, and to increase excavational difficulties. As will be seen, the dune/deflation context was one that required site-specific flexibility in the placement and excavation of test units--a flexibility that had to be maintained without sacrificing utility of the test results. The adequacy of our field strategy should be evaluated in regard to its success in obtaining the basic site data, and in coping with the problems of "deflation archaeology."

The field techniques are divided into three sets of activities. We first conducted a field reconnaissance to obtain initial planning information. The second, and major activity, was testing and mapping of the Box Canyon and Third Canyon Sites. Third, we completed surface collections and mapping at Second and Fourth Canyons. Specific procedures are discussed below.

### Field Reconnaissance

The first week of the field project was used to become familiar with the four Side Canyon Sites and the Two Rivers Site further upriver. Andrew Barsotti and I surveyed each site locality. At each site, surface materials were located and marked with pin flags to help relocate them later. Field maps were prepared to help clarify the major terrain features of each site and to record the relationship of terrain to cultural debris. Verbal descriptions supplemented the maps. The procedures were substantially similar to normal site survey with the additional precision made possible by greater time expenditure at each site.

The distinction between the Side Canyon Sites and the Two Rivers Site became apparent during the reconnaissance. The side Canyon Sites exhibited cultural and morphological similaritites that, in my opinion, allowed testing with uniform procedures. All four of these sites appeared as shell and lithic scatters, occurred in wind deflated context, and exhibited no clear evidence of structures or long-term occupation. All of these sites were situated in close proximity to one another in canyon mouth locations. Furthermore, all of the Side Canyon sites appeared to have been subject to similar erosion/depositional cycles attendant to their canyon locations. The Two Rivers Site, however, displayed the features characteristic of the late prehistoric riverine sites found along the mid-portion of the Columbia River (c.f. Schalk 1980:Chapter 3). It is an open, river-side site with high artifact density. It appeared to extend along McNary Reservoir for approximately 380 meters and extend inland approximately 40 meters. Because of their cultural features, the paucity of previous research, and the possibility of treating them as a set, we decided to concentrate our efforts on the Side Canyon Sites. The Two Rivers Site, however, should not be ignored. Indeed, erosion from McNary Reservoir and artifact collectors adds some urgency to investigation of the site. To help extend evaluation of Two Rivers, the reconnaissance data are included as Appendix D of this report. I suggest that the site be given a high priority for future testing.

Remaining field strategy was tailored to the Side Canyon Sites. The most salient characteristic emerging from the reconnaissance was the clustering of cultural material in deflated areas of the canyon interiors. In preparing the reconnaissance maps, attention was given to isolating areas in which these deflated materials could be related to adjacent, intact sediments. The intent was to locate the parent deposits in order to later gain the stratigraphic control absent in the blow-outs. Several such areas were located. The subsequent test strategy was structured largely to examine the relationship between deflated cultural items and intact deposits; and to test other areas that extended our spatial coverage over the site surface. Major aspects of that strategy are described below.

## Site Testing and Mapping: Box Canyon and Third Canyon Sites (35UM64 and 45BN188)

From among the four Side Canyon Sites, Box Canyon and Third Canyon were selected for the most intensive testing and mapping. Box Canyon was chosen because of its relatively profuse surface debris, because of the apparent high possibility of tying surface deposits to intact sediments (especially Mazama ash), and because it was the only southern shore site. Third Canyon was chosen because of the possible structural remains it contained.

The basic field strategy was similar for both sites. The first step was the placement of grid corners across the site surfaces. Second, surface cultural materials (primarily lithic debris) were located, collected, and recorded. Following surface collection, we excavated a series of 1 x 1 meter test pits to sample intact deposits. Concurrent with the excavations was the preparation of one meter interval contour maps. The maps were prepared to maintain control on the location of collected surface items and on the horizontal location of test units; and to illustrate general site physiography. Supplemental procedures including photography, recording of stratigraphic profiles, soil sample collection, and post-hole testing completed the work. Minor procedural variations between the sites resulted from the higher density of cultural remains in Box Canyon and the greater spatial expansiveness of Third Canyon. Where pertinent, technical variations are noted in the descriptions below.

Grid System

The grid pattern for each of the sites was anchored to a datum set at the apparent highest point in the immdediate vicinity. At Box Canyon, datum was set at the extreme southern portion of the site, at the edge of a present roadbed. Its location was fixed by reference to a permanent Corps of Engineers boundary survey marker. In Third Canyon, datum was placed near the northern site margin. We were unable to tie the point to a Geological Survey or Corps of Engineers survey cap. Here we fortified datum with a rock cairn, photographed it, and indicated its location on the site contour map.

Transit and chain techniques were used to establish a 30 meter grid pattern over the sites. The grid size was arbitrarily determined as one that adequately partitioned the sites while not requiring prohibitive time loss in its layout. Meridian lines were adjusted to true north and south. Grid squares were located in space by reference to its corner nearest datum. For example, 000N/000W was immediately northeast of datum, 030N/030W was 30 meters north and 30 meters west of datum, and so on. For both sites, the grid system provided the frame of reference for orienting and maintaining accuracy of the contour maps and for establishing points for transit stations needed to map site features. At Box Canyon, the grids also were used to partition the site into surface collection and numbering units. The lower artifact density at Third Canyon made such collection subdivisions unncecessary. The grid system is indicated on the site maps (Figures III-1, III-2, III-6, and III-7).

Surface Collections

Surface collection followed completion of the grid system.[1] We collected surface materials, primarily lithic debris, to retain the possibility of later comparing those materials to debris found in stratigraphic context. Materials analysis of cryptocrystalline flakes and other debitage appeared to offer the best comparative possibilities. Since such analysis was not practical in the field situation, they were taken for laboratory study. The results are included with Chapter 5 and Appendix A of this report.

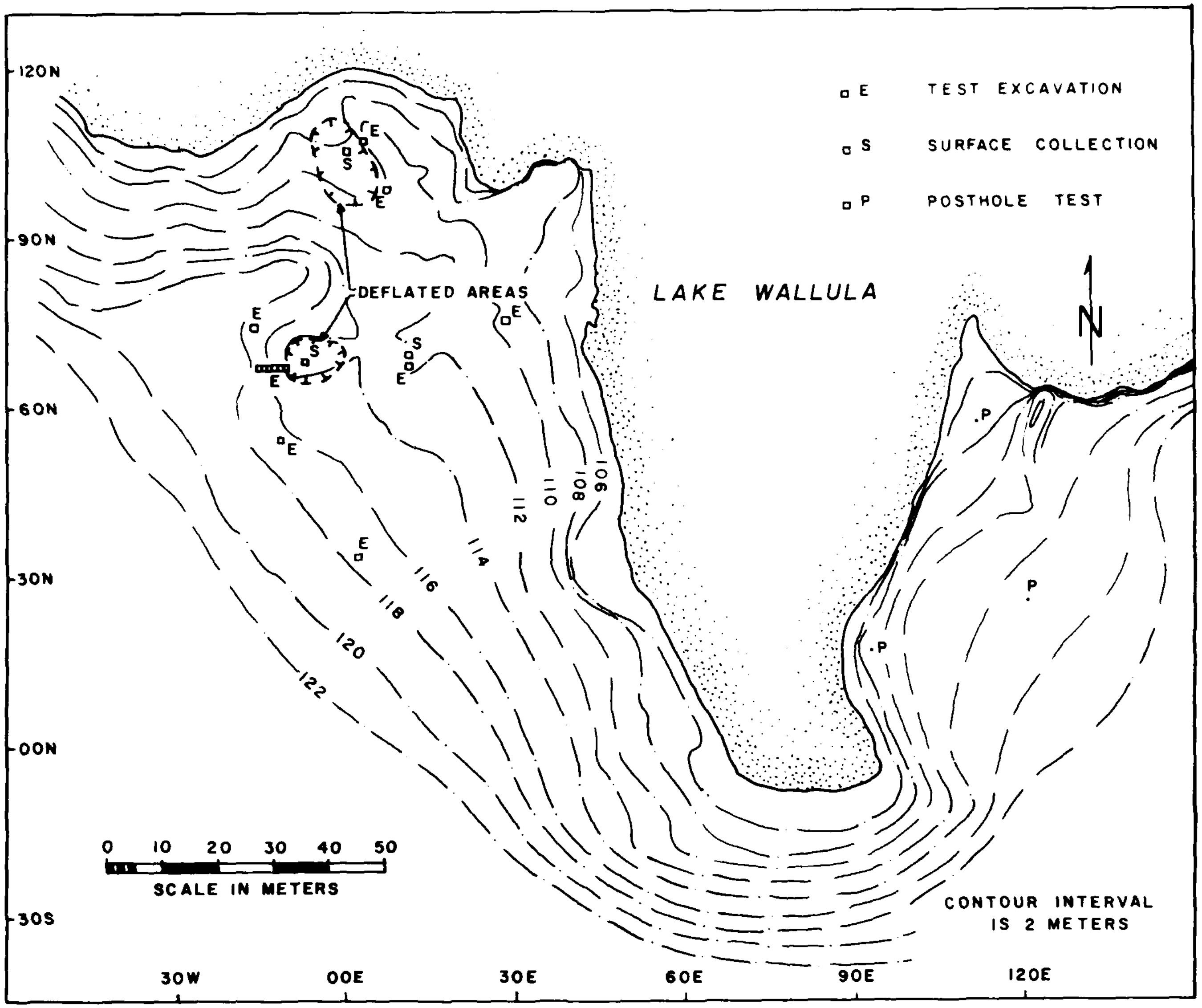



Fig. III-1. Contour Map of Box Canyon (35UM64)

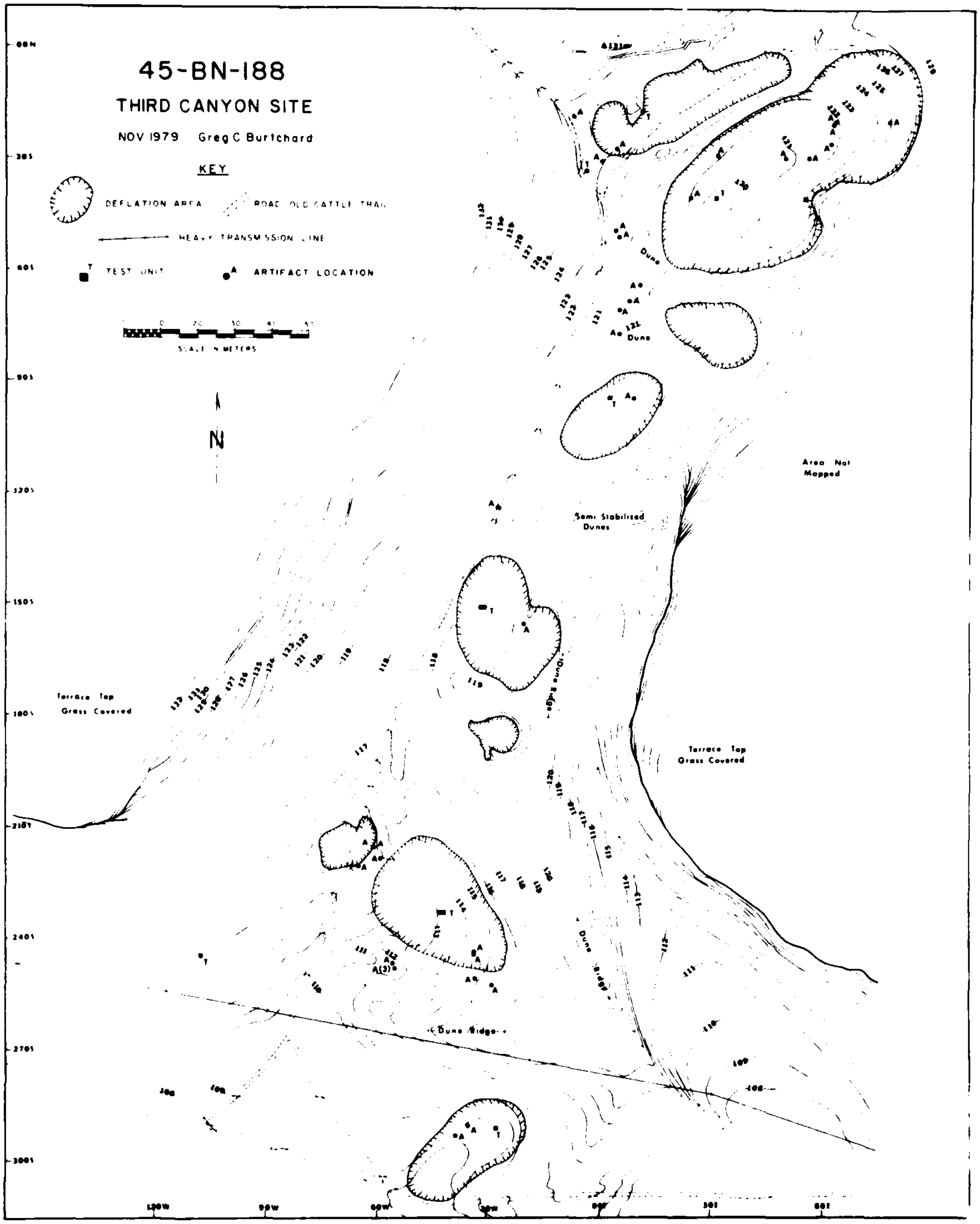



Fig. III-2. Contour Map of Third Canyon (45BN188)

At Box Canyon, collections were made by reference to the site's 30 meter grid units. Each unit was searched for lithic debris. As fragments were found, they were marked with pin flags for later relocation. Individual pieces were then collected, and their location was plotted with a transit. This was accomplished by taking radial readings from survey of points on the grid system. Angles were read from the transit and distance was read from the stadia rod. Each item was then plotted onto a gridded map surface with protactor and engineer's scale. Each item was catalogued in a manner that corresponded to its horizontal coordinates and depth below datum, described, and sent to a WARC laboratory for further analysis. Beyond the verbal data, the later addition of contour intervals to the maps provided a visual model of surface debris in three-dimensional space. Third Canyon collections strategy was identical, except that the lower artifact density made a grid-specific numbering strategy unnecessary. All spatial and descriptive data were the same. Plots of the surface scatters may be seen on the attached site maps.

## Surface Test Units

At Box Canyon, there were three areas of particularly profuse concentrations of shell and weathered bone. At this site only, we took a sample from each of these concentrations by excavating a 1m x 1m x 10cm test unit and screening the fill through 1/8-inch mesh. The small screen size was used to retain the small fragments. As with the deeper excavation test units that followed, these surface test units were oriented to cardinal directions; and coordinates of the corner nearest datum and depth below datum were recorded. Accordingly, these and all excavated units, provided spatial control to the nearest meter horizontally, and to the nearest 10 cm vertically. Recovered items were described, catalogued, and sent to a WARC laboratory. The surface test units are plotted on the Box Canyon site map. The densest scatters were sampled by units 069N/011E and 105N/000E (see Figure III-7). These were situated adjacent to wind eroded sand banks. The parent materials were later located in these banks.

## Excavation Test Units

One by one meter test units were a major element of our test strategy. They were our primary means of determining depth and horizontal extent of cultural deposits; of relating surface scatters to in situ deposits; and for comparing relative intra-site density of debris. The location of these units was of particular importance; and because of the physiography of the canyons, was a particular problem. We were concerned with placing test units in a manner that (1) maximized the probability of locating stratigraphically intact cultural debris, (2) provided wide spatial coverage of the sites, and (3) recognized excavation hindrance by sand dunes.

The dune/deflation context of the sites deserves special comment. This physical context lowers the utility of systematic spacing of test units at a predetermined metric interval. Such fixed system testing, under the proper circumstances, can provide a useful broad-scale sample of cultural materials in a manner that enhances statistical rigor in analyzing spatial patterns for those materials. We used a fixed system technique at Umatilla (35UM1) earlier in the season with productive results (c.f. Schalk 1980). Such a system, however, is best suited to sites, like Umatilla, where cultural materials are relatively dense and widely distributed, and where excavation is reasonably free of inhibiting obstacles. However, cultural deposits in the side canyons were not high density, were spatially isolated, and the surface was broken by drift sand. The fixed interval technique would fail to recognize the obvious material locations indicated by surface concentrations and features. Such fixed samples could virtually avoid the sites, although, they would do so in a most "systematic" fashion. Furthermore, they would force excavation in clearly unproductive and technically frustrating areas such as the tops of drift dunes.

In my opinion, sites like the Side Canyon Sites, are more productively sampled with a strategy that recognizes their physiographic constraints, while maintaining broad spatial coverage. At Box Canyon and Third Canyon, we attempted to do so by locating excavation units with the following considerations: (1) Units were placed in deflated areas containing visible cultural debris. In cases where the debris appeared to come from overlying, intact deposits, the units were situated to allow both vertical excavation and horizontal extension into those deposits. In cases where overlying deposits were not present, the units tested only the depth of cultural items. (2) Units were placed beyond the superficially visible limit of cultural scatter to determine site extent. Units were placed either in stabilized deposits or in swales adjacent to drift sand. The latter consideration was particularly important to Third Canyon where drift dunes were a major site characteristic. (3) Units were placed into or adjacent to deposits that appeared likely to provide intact volcanic ash deposits in hopes of obtaining absolute temporal indicators. (4) Finally, at Third Canyon, units were placed in the middle of suspected structural remnants to attempt to make a firm determination of those features.

The location and number of test units varied between Box Canyon and Third Canyon. Higher artifact density and smaller site size at Box Canyon permitted the placement of more closely spaced units at this site. Wider placement at Third Canyon recognized its greater spatial extent and low artifact density. At both sites we were able to retain wide spatial coverage and were able to chart the relationship of cultural debris to intact sediments. The final dispersal of the excavation test units and their relationship to site terrain may be seen on the site maps (see Figures III-1, 2).

As with the surface units, each 1 x 1 meter excavated test unit was set to cardinal directions. The corner nearest datum served as the coordinate point for each unit. The highest corner was used to measure sub-datum depths. Units were excavated in arbitrary 10 cm levels. All fill was screened through 1/4-inch mesh.[2] Cultural materials were removed, field sorted and counted, recorded, and sent to the WARC laboratory for analysis. Our records retain horizontal control on cultural items by reference to the coordinate identifying the grid unit, and vertical control to the 10 cm depth of each level. Units were excavated until no cultural materials were encountered for at least three levels, or until reaching bedrock. Supplemental procedures--stratigraphic profiles, photography, etc., were done after all units were completed. Figure III-3 illustrates a test unit intersecting an intact volcanic ash deposit at Box Canyon.

In three areas, test units were extended linearly to form trenches. The longest of these was at Box Canyon. Here, unit 067N/010W was extended west into an adjoining bank suspected to be the origin of extensive deflated cultural debris. Additional 1 x 1 meter units were extended, one at a time, with the same provisions that adhered to all test units. At Box Canyon, the result was a "step trench" that samples sediments from the dune bank (see Figure III-4). This unit succeeded in locating the parent deposit (Figure III-5). The same technique was used at Third Canyon to sample the interior of a roughly circular formation of sub-angular basalt cobbles previously identified as a possible structure (Cleveland et al. 1976:21); and to test a second possible feature. Neither of these units produced culturally relevant debris or features.

Maps

Contour maps were prepared to provide a visual model of site physiography, and to record the location of test units and surface materials relative to physiography. For Box Canyon and Third Canyon, one meter contour intervals were used to maximize the accuracy of the representations. The intent was to record surface site features, and to provide a reference point from which to gauge subsequent changes in dune formation, site deterioration, and surface exposure of cultural materials. The one meter interval provided the accuracy needed to illustrate most of the major shallow blow-out depressions.

The maps display the immediate site surfaces within which most of the cultural materials were located. In Box Canyon, the raised road/former railroad bed is an arbitrary southern boundary. This is the area lying within the Corps of Engineers' property line. No cultural materials were found south of the road negating the need of a field map of that area for our purposes. In Third Canyon, the map is confined to the canyon interior. I did not illustrate the terrace tops, the area north of datum or south of the road running in front of the canyon. The map, then, does not extend to McNary Reservoir. No cultural materials were found beyond any of these points; and I used them as convenient, through arbitrary, site boundaries. These boundaries allowed us to complete the map and still include major terrain features, surface materials, and test unit locations. Reference should be made to USGS topographic maps and to Figure I-1 in order to relate these features to the surrounding terrain.

The maps were prepared using transit and plane table techniques. Points on the grid system were used as map stations for the transit. The height of these points relative to datum had been determined when the grids were surveyed. They had been recorded on gridded paper and oriented to cardinal directions. From these map stations, readings were taken to determine sub-datum depth and distance of prominent terrain features. Distance and elevation were taken from chain, stadia rod, and transit angle readings. Trigonometric calculations were used where necessary. The readings were transferred to paper with protactor and engineer's scale, and new sub-datum depths were marked for each reading. Like readings were

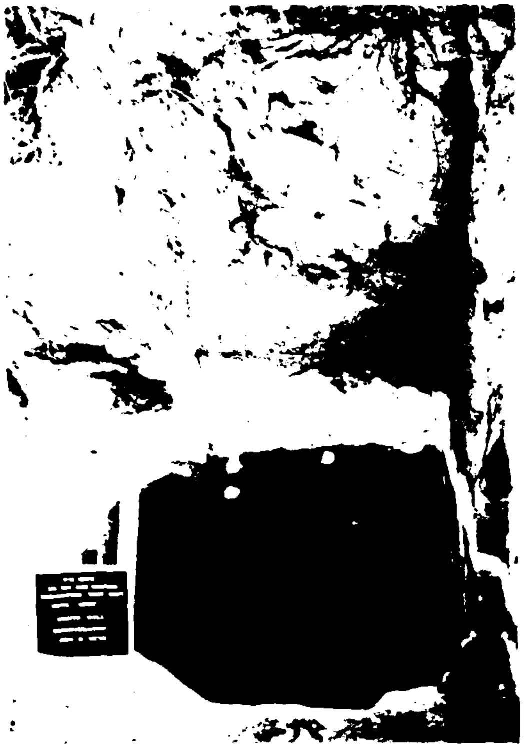


Fig. III-3. Test Unit Exposing Volcanic Ash at 35UM64

Fig. III-4. Step-Trench into Intact Deposits at 35UM64


Fig. III-5. Mussel Shell Deposit at 35UM64 connected with contour lines. Proper orientation was maintained by constant reference to the grid system and to actual terrain features. The grid corners proved particularly useful by providing visible reference points against which to check illustrated features. The grids also imposed a systematic approach that was useful for insuring complete coverage of the site surface. Both maps were completed in the field so that the final representation could be checked for accuracy. While some error should be expected, I am confident that the maps adequately model the sites as they appeared during the project (see Figures III-1 and 2).

Supplemental Procedures

Post hole tests were excavated at the bottom of those test units in which bedrock was not encountered. At Box Canyon, they were also used to test for subsurface cultural debris on the east side of the canyon mouth. The procedure was a search technique, intended to determine presence or absence of cultural items. For the excavated test units, postholes provided additional assurance that we had indeed reached culturally sterile sediments. At Box Canyon, the post-holes extended our spatial coverage onto the shallow deposits west of the lake inlet. All fill removed by the post-hole digger was screened through 1/8-inch mesh. Instead of 10 cm levels, level depths were recorded only when either cultural debris or a marked change in soil matrix was encountered. The post holes were halted at bedrock or at the maximum depth of the tool (about 90 cm). All tests extended well below observable cultural debris.

Stratigraphic profiles were drawn, and sedimentary descriptions were made for each of the excavated test units. To insure comparability of the descriptions, Kim Simmons did all of the stratigraphic work. Her techniques and results are presented in Chapter 4 and Appendix B of this report. After completing the profiles, she collected soil samples from each illustrated stratum from selected test units at both sites. Sampled units were selected to preserve the complete range of sediments represented at the sites. The samples are being retained at Laboratory of Archaeology and History (LAH) facilities in Pullman to enable checking of the soil descriptions, if necessary. Tephra samples were given to Bruce Cochran at the University of Idaho for analysis. His report is included as Appendix C of this report.

Stratigraphic profiles were also photographed with 35 mm color slides and black and white film. Photographs were taken to provide a visual check on the profiles. Photographs were also made of general site terrain and miscellaneous site features. All photographs were described and logged in a central file. These materials are available at LAH offices.

During the entire project, field notebooks were kept by the crew members. These were intended to provide a log of independent activities and a record of immediate impressions on those activities and results. They offer independent sources of information about the sites not bound by the stylistic constraints of our recording procedures. The notebooks are also on file at LAH offices.

Backfilling and removal of equipment completed the field operation. Only the datum cairns and major grid corners were left to allow for any additional fieldwork. At the close of 1980, no additional fieldwork has been done.

## Surface Collection and Mapping: Second and Fourth Canyon Sites (45BN187 and 45BN189)

No test excavations were made at either of these sites. Our intent was to record sufficient surface information to facilitate cultural comparison with Third Canyon (45BN188); and to provide information for management and potential mitigation plans. Most effort was spent on establishing an abbreviated grid system, surface collection, and mapping. Cultural features in each canyon were also recorded and photographed, and general site photographs were taken.

As with Third Canyon, datum was set on an elevated point at the northern portion of each of the sites. The datum points were situated to allow the meridian line to pass down the canyon interior and out the canyon mouth. In both canyons, the north/south meridian lines were surveyed with a transit and staked at 30 meter intervals. Each 60 meter point was marked with a long, high visibility stake. An east/west baseline was also surveyed from datum and marked at 30 meter intervals. A second line, perpendicular to the meridian, was surveyed across the canyon mouths. This second set of lines was also marked at 30 meter intervals. Height relative to datum was recorded for all surveyed points. The resulting survey lines provided a single north/south line against which to measure longitudinal canyon features; and two perpendicular lines across the front and rear of the sites, to control cross-canyon dimensions. These lines served as the frame of reference for orienting both the surface collections and site field maps. The function of the lines was analogous to the earlier grid systems, and the accuracy was identical to them. The abbreviated system simply reflected the abbreviated research requirements of these canyons.

Surface materials were mapped and described in similar fashion to Third Canyon. Records were made in order to facilitate a comparison of distribution and materials with Third Canyon. These materials combined with physiographic similarity of the canyons are our only means of investigating the possibility of similar use patterns for the three northern shore sites. As before, cultural debris was located and marked with pin flags. As individual items were mapped, radial angles were taken from the previously surveyed grid points with a Brunton pocket transit on tripod. Distances were either chain measured or paced. The measurements were recorded and later plotted onto graph paper with protactor and engineer's scale. Horizontal coordinates, to the nearest meter were taken from the map. Vertical depth below datum was estimated by reference to the nearest surveyed grid point. The resulting map of artifact distribution did not achieve the same degree of accuracy as the earlier collections taken with transit bearings. Nonetheless, relative positions were retained, and recorded relation to surface characteristics was reasonably accurate. Given the limited objectives at these sites, and sparce artifact distribution, the procedures were fully adequate.

The field maps for Second and Fourth Canyon are not contour maps as was the case with the previous two sites. Contour-like lines are used on these maps to illustrate general slope characteristics of the sites, but do not represent set metric intervals. The maps are designed to illustrate the relationship between major physiographic features and cultural materials. Accuracy for this purpose was maintained by reference to the surveyed grid coordinates. The grid system had been surveyed to provide visual scales across the rear, the front, and longitudinal center of the canyons. Major terrain features were mapped first, by taking visual sitings with a hand-held compass and pacing distances from known points on the grid system. After key features were plotted, remaining terrain features were drawn by visual reference to the grid system. Final drawings were done from elevated positions at both sides and rear of the canyons. This provided a complete view and minimized angle distortion inherent in use of a single vantage point.

The grid system proved to be extremely handy in preparing the maps. It provided a constantly available frame of reference for orienting and plotting site features. It maintained cardinal orientation, provided known points for compass readings, provided a visible, metric reference to help control distortion, and gave elevation points for key locations on the maps. The accuracy obtained was greater than that of a normal sketch field map, and less precise than full contour maps. On balance, the system worked well. I recommend it for projects that require a moderate level of accuracy, but that cannot afford the high time expenditure needed for full contour illustrations. Copies of the Second and Fourth Canyon maps are included as Figures III-6 and III-7.

Cultural surface features were found with each of the sites. Two prehistoric rock cairns are situated near the cliff edge immediately east of Second Canyon. Collapsed remains of a historic cabin are located in Fourth Canyon. Both sets of features were measured, sketched, described, and photographed. The records were added to the sample data and maps for the sites. We did not excavate or sample these remains.

Fieldwork was brought to a close with photography of the canyons. Color slides and black and white pictures were taken and logged to complete the record of the canyons. These are on file with the remainder of the site records at LAH offices in Pullman.

## Summary

Our primary objective on the project was to obtain basic archaeological data on the Columbia River Side Canyon Sites. We sought information pertinent to site size and morphology, artifact characteristics, density, and distribution, site temporal range, and physical site integrity. In addition, we worked to develop techniques that would obtain these data in the dune/deflation context of the Side Canyon Sites. The fieldwork was not intended as mitigation, but rather as a means to assist site management and informed research planning should mitigation prove necessary.

Field procedures involved initial reconnaissance, intensive testing of Box Canyon and Third Canyon Sites, and surface collection and field

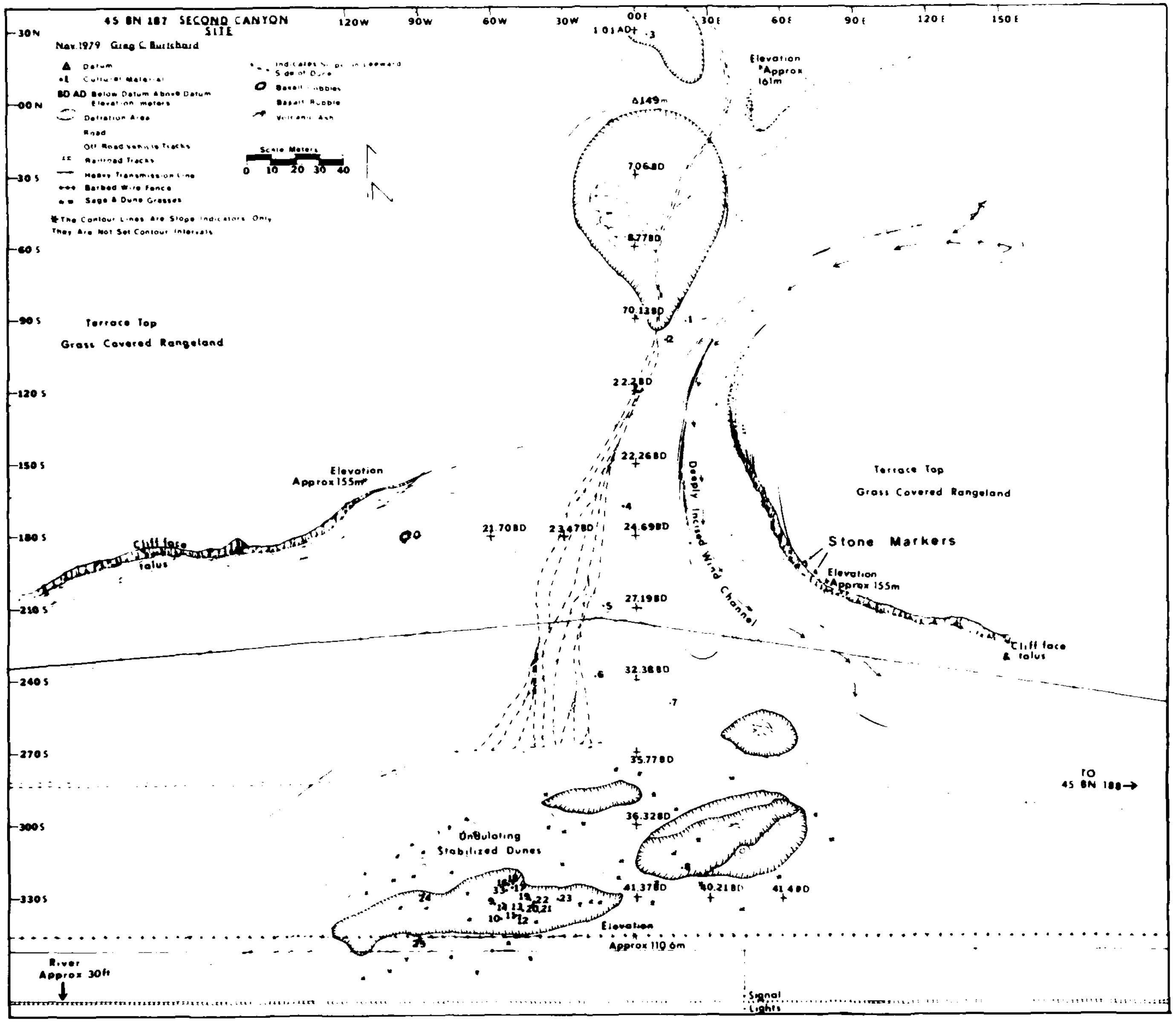



Fig. III-6. Field Map of Second Canyon (45BN187)

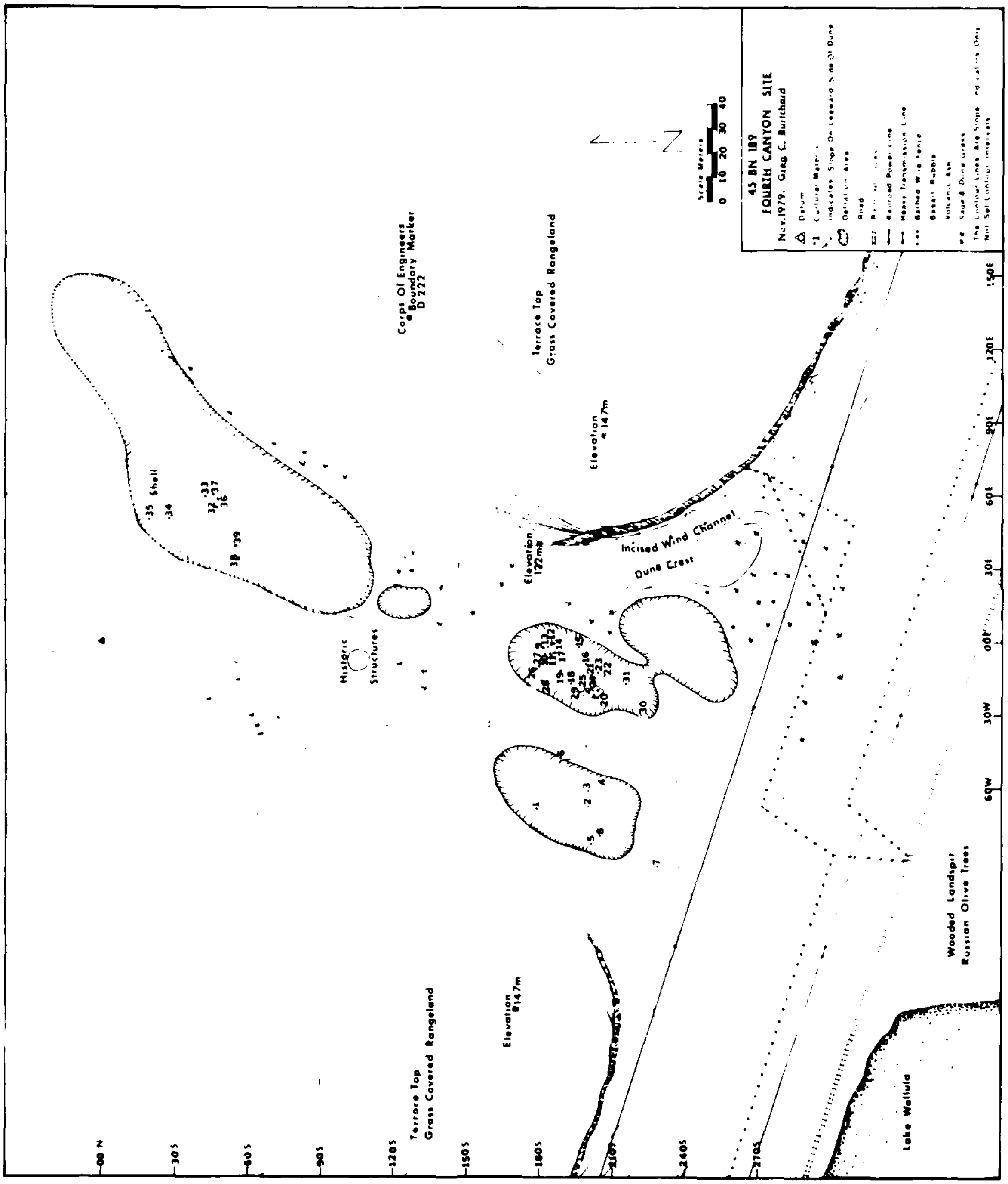



Fig. III-7. Field Map of Fourth Canyon (45BN189) mapping of Second and Fourth Canyon sites. The greatest effort was given to intensive testing, key elements of which were placement of excavation test un. ~ and preparation of contour maps. The location of test units was selected to provide the spatial coverage necessary to sample the site surfaces, while coping with the characteristics of deflated dune sites. I have argued that attention must be given to geological exposure and their relationship to visible cultural remains in order to structure a test strategy that maximizes the probability of sampling in situ materials and strata. Precise mapping techniques not only provide for close spatial control on site features and deposits, but can additionally serve as a reference for gauging the rate of continuing site deflation. This chapter has outlined these techniques to allow the reader to better evaluate the data base from which subsequent inferences and recommendations are drawn.

# NOTES

1. There is room for controversy about the desirability of surface collection techniques. In the previous season's report in this project series, for example, Delbert Gilbow argues against collection strategies. In fact, he refers to professional surface collections as "pot-hunting with a license" (Gilbow 1977:8). Though I would not use such wording, I am sympathetic to the conservation ethic expressed by arguments against surface collection. Collection, if not warranted or properly controlled, can obscure the spatial relationship of cultural items, and perhaps, remove the surface evidence of sites. I do not, however, accept blanket condemnations of surface collection. Spatial relationships can be retained, as they were here, by careful mapping procedures. The loss of surface site visibility is a spurious argument. All archaeological investigations are, to varying degrees, destructive of their subject of study. What we should be concerned with is whether or not that damage is balanced by adequate information return. A major task of the present project has been to attempt to relate surface debris to intact deposits. The manner in which this is most effectively accomplished is through comparative materials analyses of surface and excavated materials. In the present case, these analyses were more involved than could be conducted practically in the field. Furthermore, surface collection under the conditions of this project, does not remove the complete range of surface materials at all. Rains and winds constantly alter the apparent exposure pattern. As a result, collection at any single point in time provides a sample, of uncertain fraction, of the total materials present. Given the preparation of adequate maps, it is a portion that could be relocated if necessary.

   I maintain then, that surface collection strategies should be tailored to specific situations and specific data requirements. Archaeological investigations should follow the least destructive techniques possible given the constraints of the research at hand. Often, this would make surface collection unnecessary, and hence, undesirable. We should recognize, however, that circumstances differ; and that there are times when such procedures are warranted. In my opinion, they were warranted in the present study. I suggest that the interested reader consult a recent article by William Butler (1979) for a more thorough, concurring argument.

2. I had initially hoped to use 1/8-inch mesh screen. I felt that this would provide maximum retention of cultural debris. As soon as we encountered wet deposits, however, the small mesh screen became unwieldy. The time and effort required to force sand through the screens was threatening completion of the project. Accordingly, we shifted to 1/4-inch mesh and experienced few difficulties. I regret the loss of smaller particles, but the sample gathered was fully adequate for our purposes.

# CHAPTER 4

# RESULTS--STRATIGRAPHY

by

Kim Simmons

This chapter concerns the description and analysis of the stratigraphic data gathered from the two sites most intensively studied during the project. The purpose is to develop an understanding of the depositional history of the canyons and discuss what this might imply about the cultural deposits at the sites. Since they are a predominant depositional feature, the report concentrates on sand drift and dune deposits in the canyons along the Columbia River. It should be noted that the field methods used to understand the stratigraphy and the results of the analysis do not constitute a final understanding of the deposits since the project was limited to field sampling rather than extensive excavation.

The stratigraphic information was taken from test units excavated at the Box Canyon and Third Canyon Sites. Stratigraphic profiles were drawn of one wall of each 1 x 1 meter test unit excavated. The depths of the profiles vary, but all extend from site surfaces to culturally sterile deposits. In addition, soil descriptions include the depth from the subdatum corner indicated in the stratigraphic profile, the textural class, the Munsell color designation (all colors are taken from moist soils), the structure, the moist consistency, the plasticity, the presence of roots, and the presence of cultural material. Soil samples were also taken of strata in each test unit.

Lenses of primary and redeposited volcanic ash are a major feature of the sites' stratigraphy. Ash samples were taken for laboratory tephra analysis. The results are in Appendix C.

While only two sites were studied intensively, the results provide an estimate of stratigraphic features on all four canyons. All of the canyon sites studied are located between two and four miles above the present McNary Dam site. Three of these are adjoining canyons on the Washington shore and one is on the Oregon side. All four canyons are breaks in the basalt cliffs bordering the river. All have filled with sand. The single Oregon shore site, the Box Canyon Site, was tested and stratigraphic profiles prepared. On the Washington shore, the middle canyon was tested. While they vary slightly in size, the Washington side canyons appear physiographically similar. There is little doubt that they have been subject to nearly identical depositional processes. For purposes of this study, we consider the profiles from the central canyon an adequate estimate of the deposits in all three. Nonetheless, be aware that the results are derived directly from the central canyon. Some variation is to be expected in projecting results to the remaining canyons.

Test procedures were similar for both sites. Units were located with a consideration for the surface characteristics of dune-drift sites. Test units were placed on the edges of deflated areas where it appeared cultural materials were eroding out, inside deflated areas where there was cultural material, and near volcanic ash outcropping (see Chapter 3). As a result, the profiles are not taken from straight base line or meridian line axes. Rather they reflect more dispersed patterns directed by site physiography. The test unit, and hence profile, locations may be seen on the site maps in Chapter 3 (Figures III-1 and III-2). It can be seen that while not straight line projections, they nonetheless provide a widely distributed pattern across the extent of the sites.

The "Soil Survey of Benton County" puts the sites into Hezel-Quincy-Burbank soil association which it defines as:

> Gently sloping soils that have a loamy sand surface layer and are very deep to shallow over gravel, lacustrine material, or alluvium; precipitation zone 6 to 9 inches.

The site deposits themselves are most like Quincy loamy sand which is identified as being coarse textured soils located in dunelike terraces. The parent material of windblown sand is granite, basalt and quartzite, sometimes underlain by basalt at 20-36 inches (U.S. Soil Conservation Service 1971).

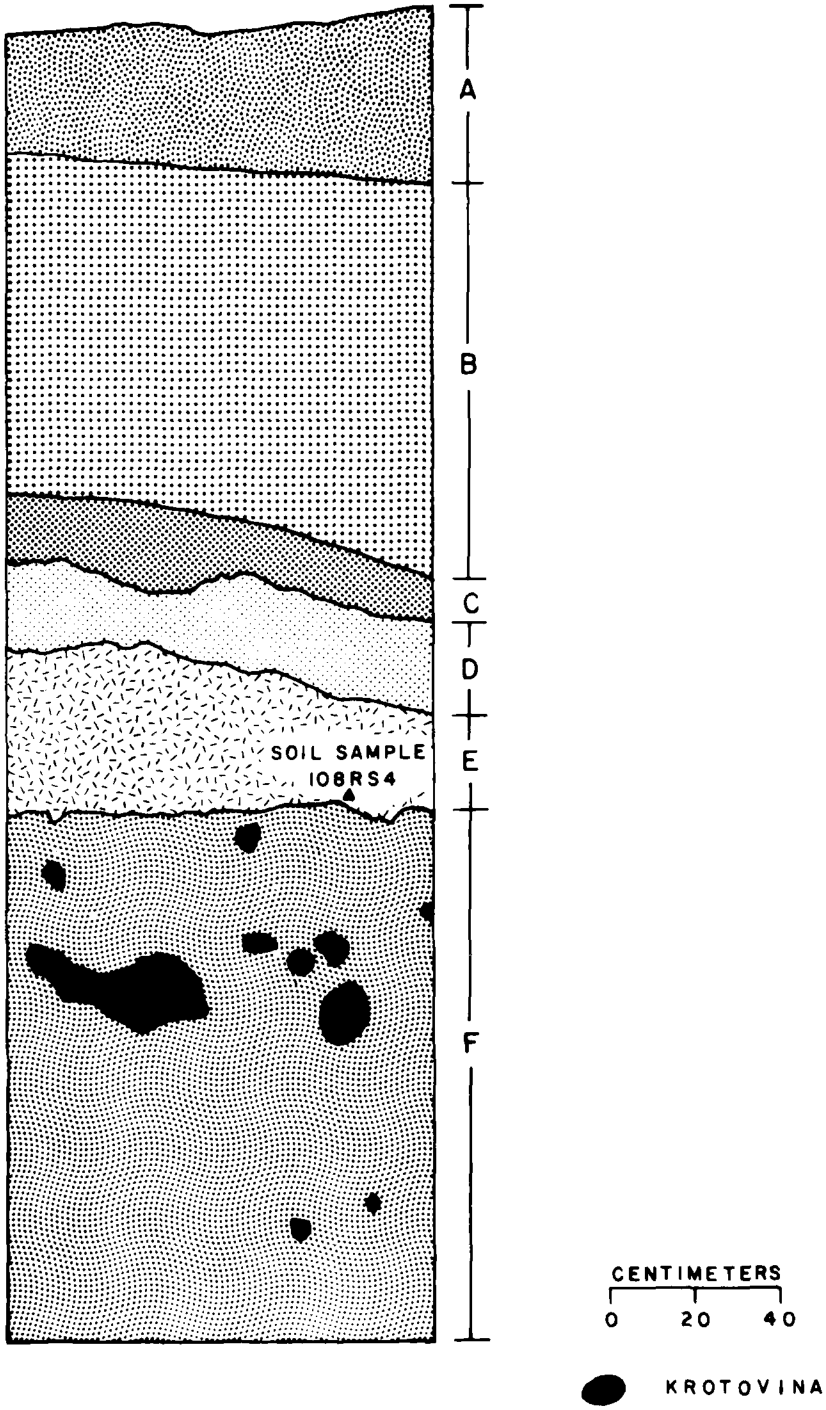
The previous survey (Cleveland et al. 1976) of these sites makes certain general statements about the depositional history responsible for the stratigraphy of the canyon sites. It was noted that an aeolian regime produces sand shadows, drifts and sheets in the smaller canyons and sand dune systems in the larger canyons and that these features overlie the basalt bedrock. The presence of thick volcanic ash deposits (probably Mazama) are noted as well.

Aside from these general considerations, little is known about the stratigraphy of the side canyons. What follows are the results of the present project, specifically as they apply to Box Canyon (35UM64) and to Third Canyon (45BN188).

## Box Canyon (35UM64)

The Box Canyon Site, on the Oregon side of the Columbia River, is not located inside the canyon but primarily on the western side slopes of a terrace above an inlet in front of the canyon entrance. The fill from an old railroad line separates the site from the main part of the canyon and has had a stabilizing effect on the sand formations in the inlet.

Thirteen test units were excavated on the west side of the inlet (and three test postholes on the east slope). The soil descriptions are contained in Appendix B. Figures IV-1 through 3 are representative profiles of test units with soil descriptions and a diagram of the relationship of the strata from all the units excavated on the site. From these




35UM64 BOX CANYON

STRATIGRAPHIC PROFILE OF
NORTH WALL OF 107N/003E

Fig. IV-1.

FIGURE IV-1

35UM64 BOX CANYON SOIL DESCRIPTIONS FOR 107N/003E

A. 0-40 cm - Medium sand, 10YR4/3, massive, loose, nonplastic, few medium to coarse, and plentiful fine vertical roots.

B. 40-129 cm - Coarse sand, 10YR4/3, moderate medium platy, very friable, nonplastic.

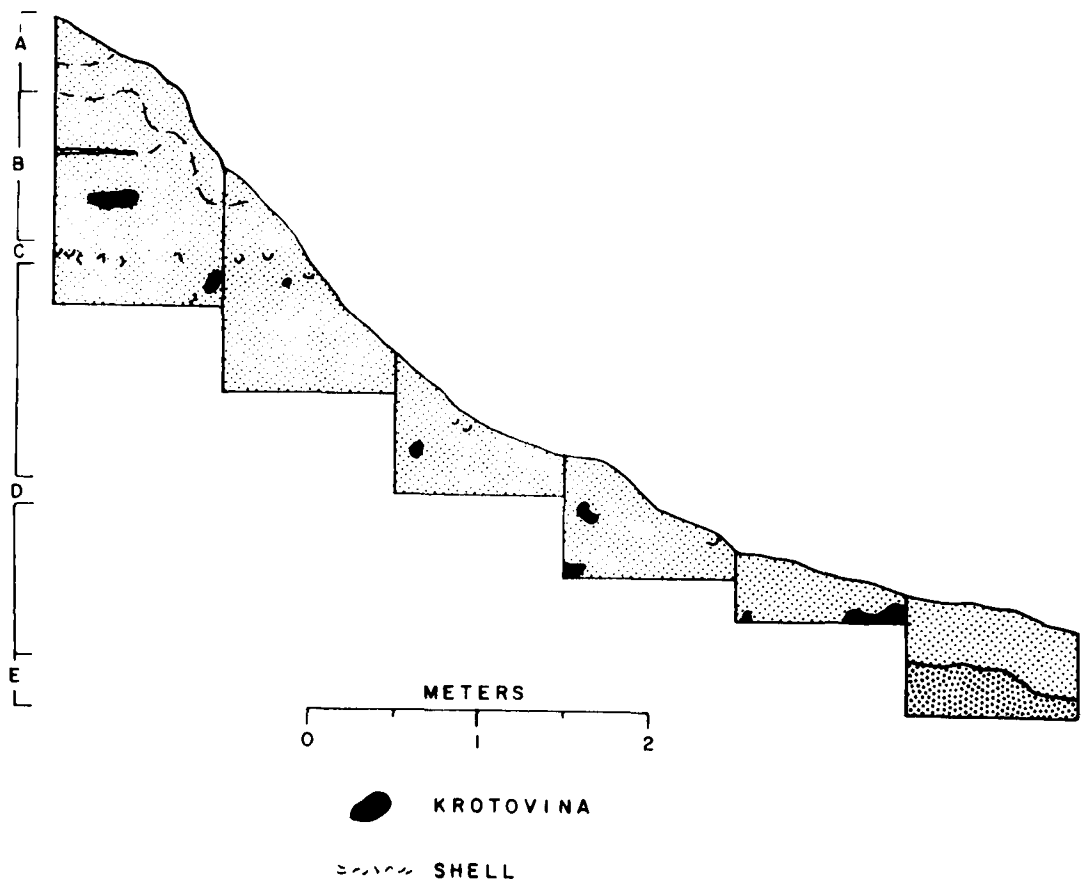
C. 129-140 cm - Medium sand, 10YR4/3, massive, loose, nonplastic.

D. 140-160 cm - Medium sand with basalt sand and organic material, 10YR4/3, massive, loose, nonplastic, cultural material present.

E. 160-186 cm - Volcanic ash, 10YR7/2, massive, firm, plastic, intense rodent activity.

F. 186-312 cm - Medium sand, 10YR4/3, massive, loose, nonplastic, rodent activity, cultural material present--in situ, carbon stains included, not associated with rodent activity.

312 cm - Basalt talus and some river gravels.




35UM64 BOX CANYON

STRATIGRAPHIC PROFILES OF
NORTH WALLS OF 067N / 010-015W

Fig. IV-2.

FIGURE IV-2

35UM64 BOX CANYON SOIL DESCRIPTIONS FOR 067N/010-015W

A. 0-40 cm - Medium sand, 10YR4/3, massive, loose, nonplastic, plentiful very fine roots and few medium to coarse vertical roots, cultural material present--lag.

B. 40-130 cm - Medium sand, 10YR4/3, massive, loose, nonplastic, few coarse horizontal disintegrating roots, cultural material present--lag.

C. 130-140 cm - Medium sand with high mussel shell concentration, 10YR4/3, massive, loose, nonplastic, cultural material present--*in situ*.

D. 140-235 cm - Medium sand, 10YR4/3, massive, loose, nonplastic, no cultural material except near surface and rodent activity.

E. 235-267 cm - Fine sand, 10YR5/3, massive, very friable, nonplastic.

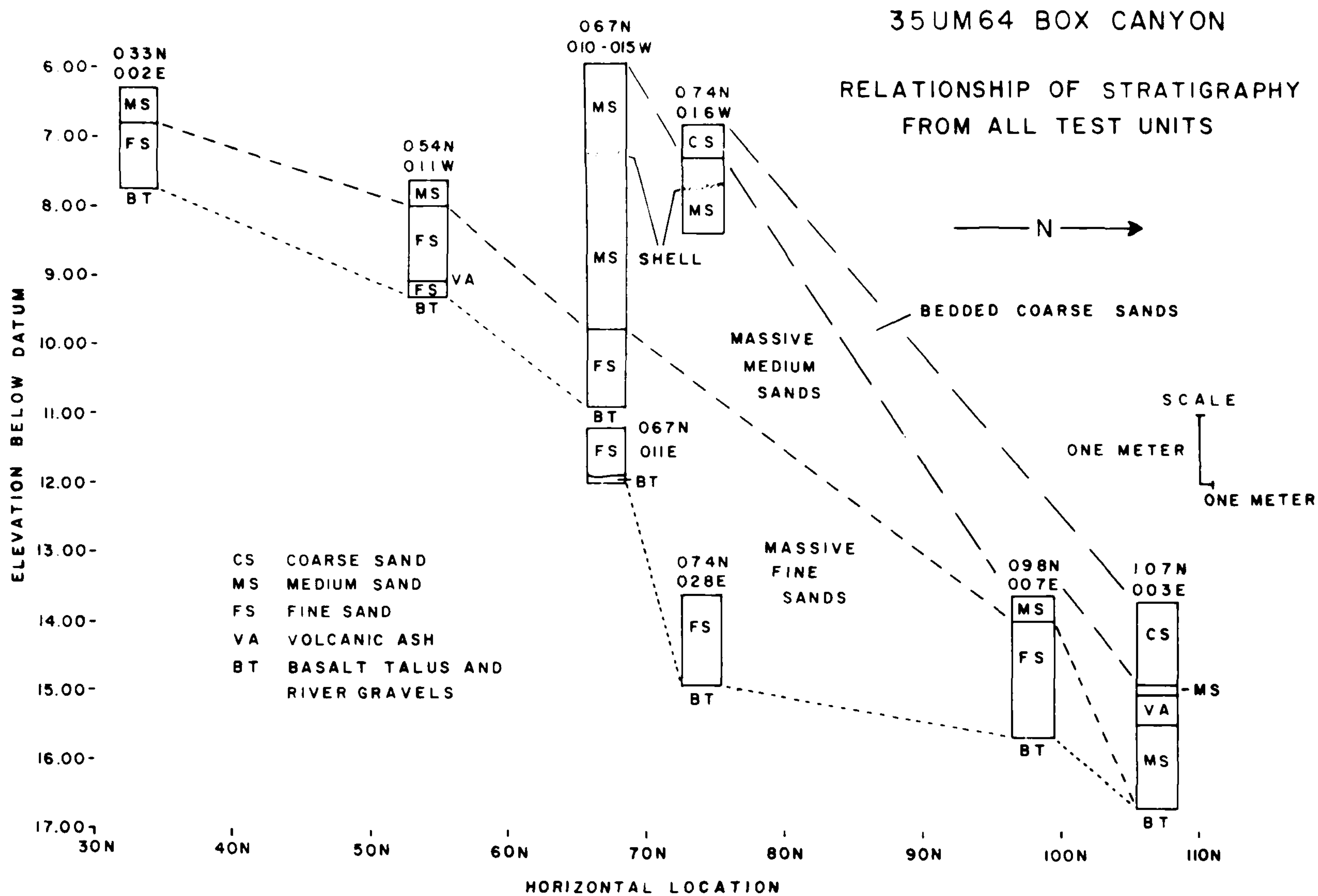



Fig. IV-3. Intra-Site Relationship of Stratigraphy at 35UM64 diagrams the important strata of the site can be seen. The uppermost stratum at Box Canyon is horizontally bedded coarse sands which are never thicker than 60 cm but usually much thinner. These bedded sands overlie massive medium grain sands which make up the bulk of the deposits. This stratum may be as much as 185 cm thick. It is this unit which is interrupted by a 40 cm thick deposit of volcanic ash heavily disturbed by krotovina. Below the medium sands is usually a unit of massive fine sands, perhaps with some silt. This deposit is never more than 135 cm thick and is bounded beneath by either river gravels or angular basalt talus and the basalt bedrock; occasionally a very coarse basalt sand is present with one of the above.

From these strata, inferences about the depositional history of the site can be made. The primary regime is aeolian. Land formations common to wind deposition and relevant to this site are sand drifts and shadows along with deflation lag areas.

Sand drifts and shadows probably account for most of the deposits at the Box Canyon Site. They are defined by Reineck and Singh (1975) as accumulations of sand formed when sand bearing winds are checked by obstructions or when the wind sweeps over a sudden drop in ground level, such as a cliff edge or canyon. Sand dunes, however, require large flat areas to develop. Probably the massive medium and fine grain sand units are a result of sand drifts forming on the basalt cliffs or slopes of the inlet. The profile of the basalt bedrock within the site can be seen from Figure IV-3. There are problems however. For example, it is uncertain why fine sand deposits were overlain by medium-grained sand. The pattern may have resulted from changes in wind direction and velocity or from differences in the sources of the sand. Another possibility would involve two separate periods of deposition perhaps interrupted by wind deflation. Although, in this case, the former lag deposits should be preserved between the medium and fine-grained sands. There were no such lag deposits found. The massive structure of the deposits indicate that the units were rapidly or intensively deposited.

The coarse bedded sands of the uppermost strata are located only on the highest surfaces of the drifts away from deflated areas. They may be more recently deposited sand, perhaps from further inside the canyons, or related to dune-like sand movement.

The deflation lag areas occur between drifts where the sand is being removed by wind action (c.f. Reineck aad Singh 1975). Deflated areas or blow-outs are dish shaped. Their surfaces are scattered with debris from the deposits that have been removed from above. Although the earlier study (Cleveland et al. 1976) argued that the debris tended to retain its horizontal position, this appears only to hold for the heavier objects such as cobble sized rocks. Smaller and lighter materials tend to erode out and avalanche toward the center as the sides are deflated away. This is particularly evident in Box Canyon where the deflated areas sides are steep and high (see Figure IV-2 and Figure III-1).

At some time during the deposition of the massive medium sands, probably as sand drifts were filling the basalt slopes, there was a thick volcanic ash fall. The ash has been analyzed as a primary fall from the

Mt. Mazama eruption and, thus, is datable to about 6,700 B.P. (see Appendix C). The depositional environment active at the time of this event had been in effect for some time before and continued after the ash fall as shown by the depth of the medium massive sand.

The Box Canyon deposits contained cultural materials both as surface scatter, or lag deposits, in blow-outs and as in situ deposits existing prior to present deflation. The materials are found primarily on the west side of the inlet. On the east side, cultural materials were limited to a few surface items. The lag deposits are without depositional context. Primarily, lag is a mixture of shell and bone fragments, some basalt and cryptocrystalline flakes, with occasional larger tools and fire-cracked rock as well as basalt talus and river gravels. In most of the deflation areas, the cultural materials are unsegregated, but near the edges there will occasionally be concentrations, usually of shell, which have recently eroded from the sides of the deflated areas. These concentrations proved to be indicators of in situ deposits which constitute the source of the surface materials.

In Box Canyon, three test units, in two areas, were found to contain in situ cultural deposits that were indicated by mussel shell concentrations eroded from drifts as lag. Two of these are shown in the profiles accompanying this discussion. Test unit 107N/002E illustrated in Figure IV-1 contains the volcanic ash deposit within the very thick, massive, medium sand unit. Although some cultural material is present above the ash, it is primarily worn shell fragments which may have been part of the sand movement. However, below the ash the density of cultural material increased, and begins to include items such as flakes, bone, charcoal, and even eggshell. The increase in the cultural deposits is greatest at 80-100 cm below the ash and continues with decreasing density to the basalt talus. Cultural materials are more completely described in Chapter 5 and Appendix A. Though krotovina are present above and through the ash, they were not associated with the cultural materials. Two charcoal samples found with the culture-bearing deposits have been dated to 6,320 ± 200 B.P. and 6,820 ± 200 B.P. by the Radiocarbon Dating Laboratory at Washington State University. The dates, combined with the overlying primary fall from Mt. Mazama confirm the insignificance of rodent mixing and establish a temporal referent for the site.

The second area bearing cultural materials was excavated as a series of 1 x 1 meter units stepped into the dune slope to a large deflation. Figure IV-2 and the site map (Figure III-1) illustrate these test units. Here, the strata are primarily massive medium sands but contain a horizontal lens of shell halves extending well into the drift. The deposit is usually one to three shells thick and contains some carbon. In another test unit located in the same drift approximately 7-8 meters from the unit in Figure IV-2, test unit 074N/016W (on the site map), a thin deposit of shell halves, was also contained in the massive medium sand. There was a difference of 45 cm in elevation between them, indicating they are possibly related stratigraphically and may have been deposited on a former drift surface following the form of the present drift.

Within the culture bearing deposits of the two areas, there are similarities. They occur as mixed deposits within the massive medium sand, and have no culturally relevant features such as pits or hearths in the stratigraphic profiles. This may be due to the looseness of the sand that might not retain vertical indications of these features. This might also indicate low intensity use of the site. It may also result simply from limitations of a restricted sample. Their existence should not be discounted on the basis of this study alone.

Unlike 107N/003E, however, this second test area exhibited no association between the cultural deposits and volcanic ash. The ash, if ever present, has since been lost by past wind action on the dune. Unfortunately, the carbon found with the shell was limited to dispersed flecks inadequate for radiocarbon dating. The only stratigraphic variable that would link this area temporally, with the cultural deposits in the first area is thin co-occurrence in massive, medium sands. In the absence of other criteria, we cannot determine unequivocably whether the two areas represent a single occupation of the site, or temporally separate cultural components. If subsequent excavations are undertaken, it is suggested that they maintain careful stratigraphic control as one means for resolving the occupational sequence.

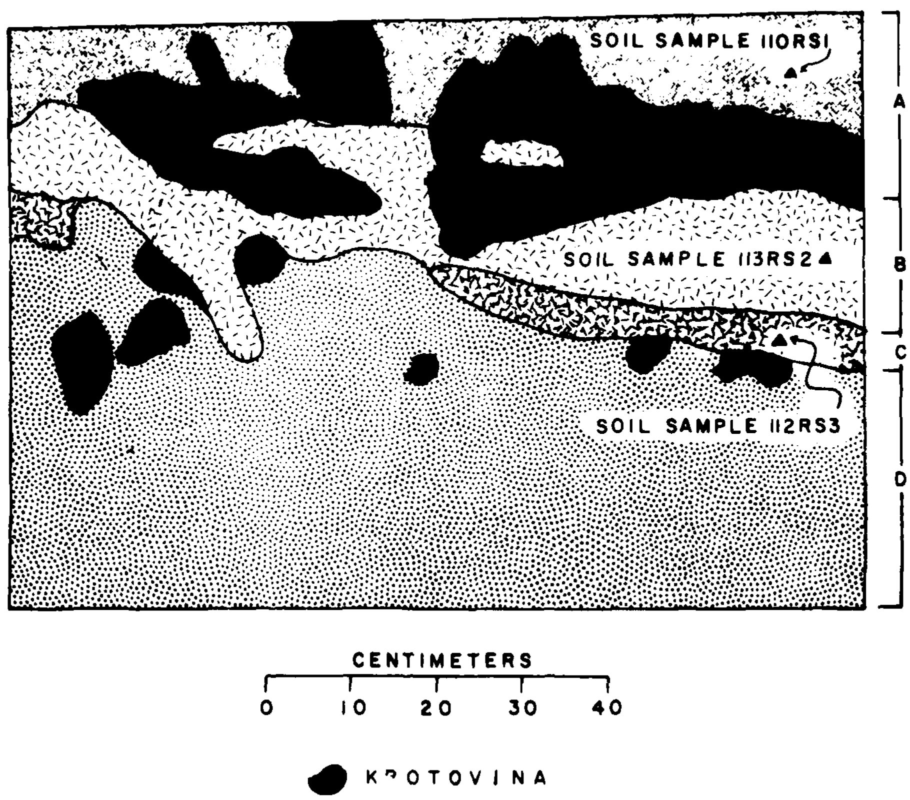
In summary, we have found this site to be within sand drifts and shadows formed on basalt which contain several distinct geological strata. These are coarse grained evenly bedded sands, massive medium grai sands interrupted by volcanic ash, fine grain massive sands, and basalt bedrock. Within the medium grain sands are located cultural deposits probably related to cultural lag deposits that appear in the deflated areas on the site surface.

## Third Canyon (45BN188)

The second site stratigraphically studied was the middle canyon on the Washington shore: 45BN188 or the Third Canyon Site. This site is dispersed over a larger area than the Box Canyon Site. It covers the area between the basalt cliffs and bounding the canyon rather than a small area near the river shore.

In 45BN188, nine test units were excavated on the canyon floor; four were located in deflation areas, two in deflation areas with ash, and three near the canyon's basalt walls (see Figure III-2). In one of the units near the canyon wall, there was some volcanic ash. Figures IV-4 and IV-5 are of representative stratigraphic profiles with soil descriptions. These are followed by a diagram of the relationships of the strata for all of the test units (Figure IV-6).

The strata that develop from this information are similar to those outlined for Box Canyon, but differences may be seen in the relative thickness of the deposits. This probably is explainable by the different areas of the canyons being studied. At Box Canyon, excavations were restricted to the canyon mouths. At Third Canyon, excavations sampled a greater portion of the canyon length. Different land formations are predominant in each case and are responsible for the thickness of the stratum. In Third Canyon, the uppermost stratum is a




45 BN 188

STRATIGRAPHIC PROFILE OF

WEST WALL OF 017S/010E

Fig. IV-4.

FIGURE IV-4

45BN188 SOIL DESCRIPTIONS FOR 017S/010E

A. 0-22 cm - Volcanic ash, 10YR5.5/3, massive, very firm, plastic, intense rodent activity.

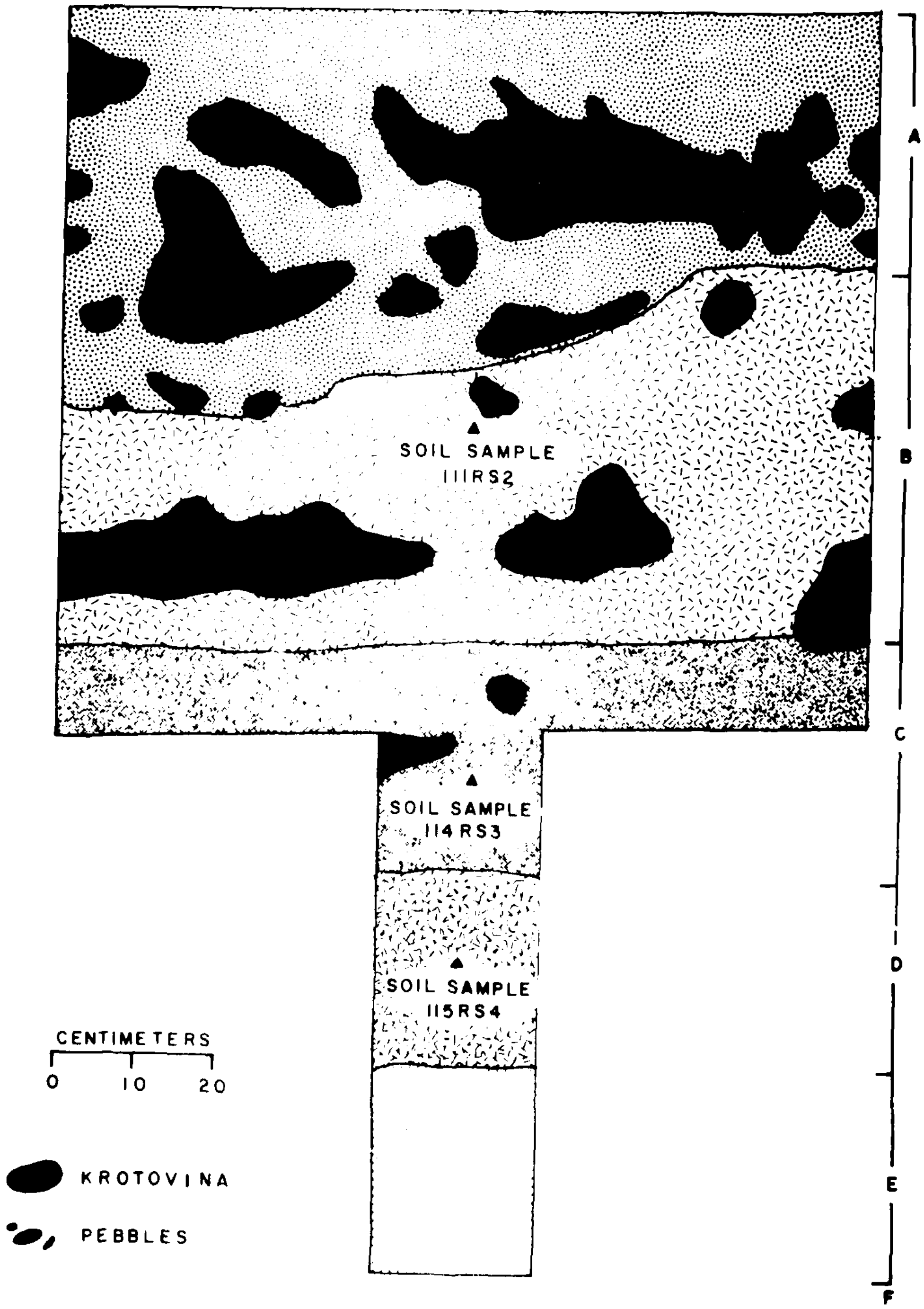
B. 22-37 cm - Volcanic ash, 10YR7/2, massive, very firm, plastic, intense rodent activity.

C. 37-43 cm - Volcanic ash, 5YR6/3, massive, very firm, plastic, intense rodent activity.

D. 43-70 cm - Medium grain sand, 10YR4.5/3, massive, loose, non-plastic.

PH. 70-160 cm - Medium grain sand, 10YR4.5/3, massive, loose, non-plastic. Not illustrated.

PH. 160 cm - Basalt talus. Not illustrated.




45 BN 188

STRATIGRAPHIC PROFILE OF NORTH WALL OF 150S/030W

Fig. IV 5

FIGURE IV-5

45BN188 SOIL DESCRIPTIONS FOR 150S/030W

A. 0-32 cm - Medium grain sand, 10YR4.5/3, massive, loose, nonplastic, intense rodent activity filled in with ash or ash and sand mix.

B. 32-78 cm - Volcanic ash, 10YR6.5/2, moderate medium platy, firm, plastic, rodent activity.

C. 78-107 cm - Volcanic ash, 7.5YR5.5/4, massive?, very firm, plastic.

D. 107-131 cm - Volcanic ash, 10YR7.5/2, massive, very firm, plastic.

E. 131-157 cm - Fine grain sand, 10YR4.5/3, massive, very friable, nonplastic.

F. 157 cm - Basalt talus.

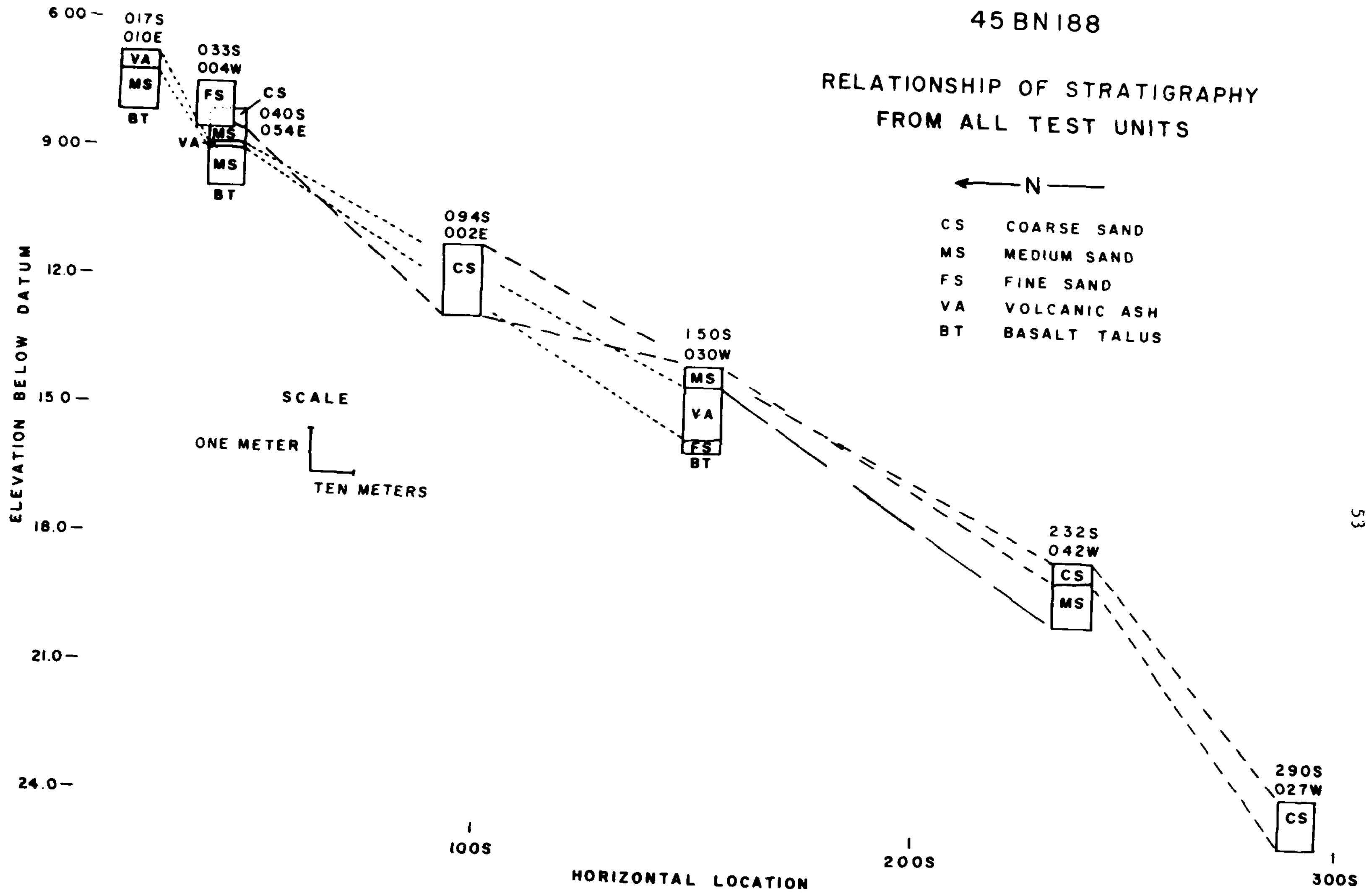



Fig. IV-6. Intra-Site Relationship of Stratigraphy at 45BN188 layer of coarse horizontally bedded sands. The sands are often 120 cm and more thick and are found in those deflated areas that did not contain volcanic ash. Since no test units were placed on dunes or drifts between the deflated areas, this restriction could be due to sampling bias. Under the upper stratum is a layer of massive medium sands never found to be more than 120 cm thick. The stratum is sometimes interrupted by volcanic ash. The ash in 45BN188 is thicker than in Box Canyon; as much as 100 cm thick. This may be due to sand mixing and redeposition. In a few units, a massive fine sand was found below the ash. The basalt bedrock is found beneath this. The depth of the basalts was not located in all units for 45BN188 since there are deeper deposits in the center of the canyons. As a result, our test units could not be dug deep enough to find them.

The relationship of the strata across the site is more confused than in Box Canyon as seen in Figure IV-6. This probably results from a greater quantity of unstabilized sand more actively being moved by wind action. In the case of 45BN188, the depositional formations duplicate those found in Box Canyon with the addition of sand dune systems which are due to the large flat area within the canyon. Sand dunes are migrating hills of sand forming in colonies in flat unobstructed areas (Reineck and Singh 1975:185-212). They retain their shape as long as the wind conditions remain the same. In all three northern shore sites, Barchan-like sand dunes are found in the broad entrances and extend toward the back of the canyons. Barchan dunes are convex shaped and formed in unidirectional wind that is low in strength (Reineck and Singh 1975). However, as the canyons narrow or when the dunes near the basalt walls, the dune movement breaks down into sand shadows and drifts that become controlled by the shape and slope of the basalt cliffs and the movement of the wind. In Third Canyon, the deflation lag areas are an integral part of the dune system itself. They form the dipping interdune and the windward slope of the dune that result as the sand is deflated out and carried over the summit of the dune to avalanche down the slip face. This differs from Box Canyon where deflated areas result more from the scouring away by wind, altered as it moves around obstacles. This difference is illustrated in the strata common to the test units of the deflation areas. In Third Canyon, strata are predominantly coarse grained and evenly laminated sand. They are often quite deep but occasionally underlain by the massive medium sands common in the drift deposits. But in Box Canyon there are typically medium and fine grain sand deposits.

Volcanic ash similar to that in Box Canyon was found in three test units. In these units, the ash is deposited within massive medium grain sand with little or no sign of the evenly laminated coarse sands. In two cases, in the back of the canyon, the deposits have not been subjected to sand dune movement which would have probably completely mixed or deflated the ash deposit as the dunes migrated. The third unit is about midway to the entrance of the canyon and exhibits more sand mixing.

In the two units whose profiles are shown in Figures IV-4 and IV-5, the volcanic ashes are thicker than in 35UM64 and have been stained from light grayish brown to light reddish brown or pink as compared to the usual light gray. The unit in Figure IV-5 even has sand lenses within the ash. These aspects indicate some kind of reworking within the ash deposit, either by wind or (doubtfully) by water since there possibly is an intermittent stream for runoff from the hills. Such runoff, however, is probably quite infrequent.

At 45BN188 cultural materials were encountered only as deflation lag surface scatters. There were no in situ subsurface cultural deposits, and the surface scatters did not extend more than two centimeters below the surface. This contrasts sharply with Box Canyon where, even around deflated areas, cultural scatter extended down approximately 20 cm. The cultural deflation lag and surface scatter show no concentrations of shell or other indications of in situ deposits as in Box Canyon. (In 45BN189 there are shell and bone concentrations.) However, in one deflated area, there are scattered large broken basalt talus fragments. These are the rocks designated as a possible habitation in the previous study (Cleveland et al. 1976). However, they appear to be natural, and may have originated from the line of the basalt cliffs facing the Columbia River. In addition, there is no cultural debris either above or below the surface of these features.

Since most of the cultural material scattered through the site is in reworking dunes, it is not possible to relate it to the volcanic ash for relative dating purposes. In several of the deflation areas near the entrance of the canyon, there are small calcium carbonate encased objects that are twig or root shaped. Some appear to have originally contained bone and cancellous tissue. Carbonate contamination and replacement of bone callogen may occur at a constant rate (c.f. Mierendorf in Cleveland 1976). If so, these carbonate objects may provide temporal indicators.

Whether the presence of these carbonates indicate even a rough temporal estimate is uncertain, but may offer interesting possibilities for future research.

To summarize, in Third Canyon we have found the same kind of natural strata as in Box Canyon but differing in aspects due to the presence of active dune activity. Unlike Box Canyon, cultural debris was restricted to the surface with no in situ deposits found or indicated. Given physiographic similarity, and similarities in surface cultural materials, it is likely that strata identical to those at Third Canyon also occur in Second and Fourth Canyons. For purposes of this report, strata of the Washington shore sites is considered identical. More precise stratigraphic control should be stressed if and when additional research is conducted at these canyon sites.

# CHAPTER 5

# RESULTS--CULTURAL MATERIALS

Data recovery techniques were designed to provide descriptive data relevant to both site structure and content. Geological aspects of site structure were discussed at length in the preceding chapter. In this chapter, site structure is confined to site dimensions and the relationship of cultural materials to geological strata. Site content, of course, refers to observed cultural materials and features. Below, structure and content are described for each of the four Side Canyon Sites. Box Canyon is described independently, and the northern shore canyon sites are discussed together. The organization reflects the nature of the results. Box Canyon is the only site providing clear evidence of in situ cultural deposits, and the only site exhibiting internal partitioning of cultural elements. The northern shore sites lack such characteristics and display uniformity of structure and content that allow them to be considered as a group.

## Box Canyon (35UM64)

### Site Structure

The surface morphology of Box Canyon is illustrated on the site contour map (Figure V-1) and in a photograph in Chapter 2 (Figure II-4). As with all of the sites, its most salient characteristic is the dune/deflation nature of the surface. Surface cultural materials are clustered in the areas indicated on Figure V-1, but lower densities were also observed downslope from the clusters and at widely spaced points over much of the illustrated surface. Based on surface indications, the entire illustrated area was selected for study.

More concentrated activity areas, reflected in subsurface site structure, are restricted spatially. Subsurface materials were sampled by procedures discussed at length in Chapter 3. Test units were excavated west of the canyon mouth. Test units and post hole tests for presence or absence of cultural items were excavated on the eastern side. Materials were screened, collected, and analyzed. Complete results for each test unit are on file in LAH offices and are summarized in Appendix A of this report. They provide the basis for several conclusions relevant to subsurface structure.

Tests on the eastern side of the canyon produced shallow, relatively artifact-free deposits overlying parent basalts. The paucity of subsurface remains coupled with slope characteristics of the eastern side implies restricted or temporary use of that area with little or no accumulation of cultural debris.

The density of cultural materials increases west of the canyon mouth. Test units excavated in deposits near the most profuse surface

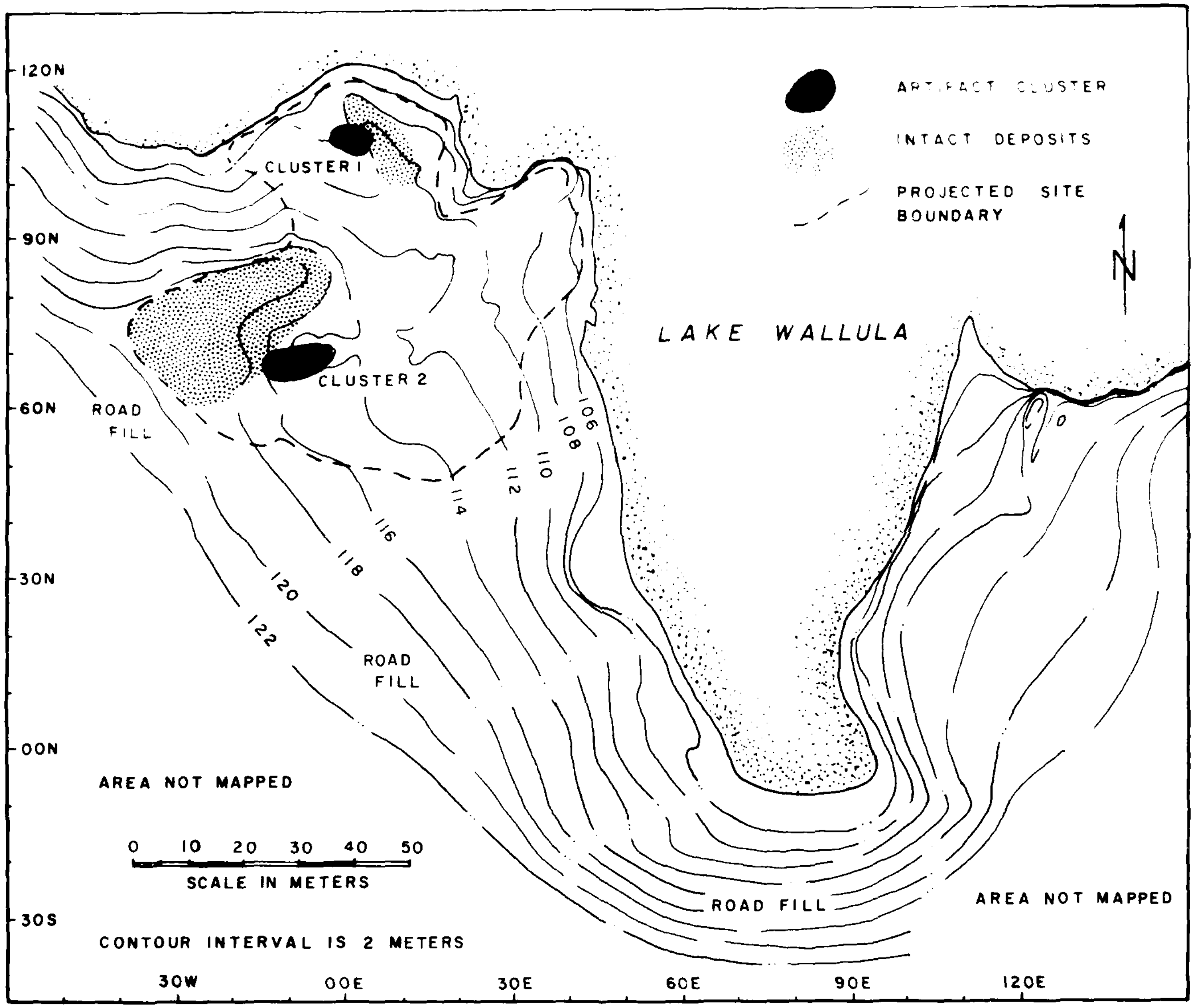



Fig. V-1. Exposed Cultural Materials at Box Canyon (35UM64) scatters obtained cultural remains from intact deposits. Tests away from these two areas, labeled Clusters 1 and 2 on Figure V-1, exhibited a marked reduction in cultural debris mixed in shallow deposits overlying bedrock. Unfortunately, implications of the results for subsurface site structure are obscured by railroad fill to the southwest, and by severe erosion to the northwest and between the clusters. Nonetheless, certain patterns are indicated. One test northwest of Cluster 2 (Test Unit 074N/016W) produced notable counts of debitage and mussel shell in relatively undisturbed deposits. This implies continuation of the site in that direction. However, other units placed to the southeast on apparently undisturbed surface between the deflations and road fill exhibit a sharp drop in material densities. If the site extended in the southeast, it has since been lost and the natural surface re-established.

Based on the data at hand, it appears that the site is confined to an area immediately overlooking the cliff face, extending southwest from the cliff where slope characteristics were adequate for living surfaces. Remnants of intact geological deposits preserve our best and perhaps only evidence of subsurface materials. Shaded areas on Figure V-1, then, not only indicate intact deposits, but the probable extant limits of subsurface cultural materials as well. The dotted outline on Figure V-1 is a projection of a maximal prehistoric site boundary. The boundary is a subjective evaluation of slope, surface densities and subsurface remains.

The relationship of cultural materials to stratigraphic deposits could be determined only in the two areas where intact deposits remain. Stratigraphic profiles were completed for each. These were illustrated and discussed in the preceding chapter. The profile illustrated in Figure IV-1 was excavated through culture bearing deposits near Cluster 1 (Test Unit 107N/003E). Figure IV-2 illustrates strata in the dune overlying Cluster 2 (Test Units 057N/010-015W). The location of test units may be seen on Figure III-1). In both cases, cultural materials are in medium sands with identical descriptive characteristics. Despite this similarity of sediments, it cannot be assumed that the deposits are contemporaneous. Overlying strata in the two units are quite different. Cultural materials from 107N/003E clearly underlie a massive volcanic ash deposit. The tephra were subsequently analyzed and established as primary fall from Mt. Mazama. The materials from 067N/010-015W, however, show no relationship to ash. They occur, rather, in apparently homogeneous dune sand stratified only by relative abundance of vegetative material. While it is possible that ash deposits have simply eroded away at this portion of the site, it is equally possible that cultural materials near Cluster 2 reflect a later utilization of the site. The relationship of materials from the two clusters remains to be established in subsequent research. Present stratigraphic data simply provide the first clue of partitioning, perhaps temporal partitioning, within the site.

The final noteworthy characteristic of site structure is the manner in which cultural materials are distributed within the sediments. Items removed from Unit 107N/003E were tumbled in dune sand. We were unable to discern a clearly defined use surface.[1] The extent to which the same pattern extends throughout the remainder of the northern deposit is yet to be determined. We were unwilling to further damage the remaining deposits by extending the test into them. Cultural materials from 067N/010-015W, however, formed a distinct surface on dune sands (see Figure III-5). The surface materials in Cluster 2 appear to be derived from this lens. They have simply collected in the deflated area southeast of the dune as it eroded. The difference between the two deposits probably reflects corresponding differences in natural post-depositional disturbances. It is also possible that the tumbled artifacts from the northern unit simply reflect test unit location. If further research is planned, care should be taken to search for natural depositional levels within the tumbled deposits.

Site Contents

Site contents were sampled with the same procedures used to determine site structure (see Chapter 3). Summary results for each test unit are available in Appendix A. Below, these data have been further collapsed both for clearer presentation and to derive counts adequate for meaningful comparison.

Materials at Box Canyon are dominated by mussel shell, bone, and lithic debitage. There are few artifacts and surprisingly few fire-cracked rocks (see Tables V-1 and 2). Most of these materials came from surface and subsurface remains near the two areas of intact deposits. Beyond the strictly descriptive function, materials were collected to facilitate comparison between the two areas of intact deposits, and between surface remains and subsurface deposits. The former was undertaken to search for differential patterning of materials across the site and to derive corresponding implications for differential site use. The surface/subsurface comparison was designed to attempt to relate mixed lag deposits to in situ parent materials.

The second problem, that of relating lag deposits to parent materials, proved to be quite difficult. I had hoped to do so by quantifying variations in lithic materials and color phases, then statistically compare the resulting frequencies from surface remains to those from subsurface deposits. Table V-3 illustrates the comparison of lithic materials types. Surface finds south of 090N were counted together for comparison with subsurface items from 067N/010-015W. These represented the southern, or "Cluster 2," portion of the site. Surface lithics north of 090N were compared with 107W/003W to search for correlation with the northern deposits (near Cluster 1). Table V-4 is organized in the same manner but quantifies the debitage by flake pattern rather than by materials type. The color phases are not presented.

I had assumed that given adequate sample size, a strong positive correlation in materials types and/or color phases would support arguments that treated materials from lag deposits in a similar fashion to in situ materials--a measure of control could be gained for the otherwise mixed materials. Unfortunately, the data are not sufficient to relate unequivocably the lag deposits to the in situ materials. The dominance of basalt in Cluster 2 corresponds to a similar dominance in Test Units 067N/010-015W, but other materials either reflect the pattern weakly or not at all. In any case, the sheer dominance of basalt to the total debitage count leaves the frequency of other materials too small for statistical manipulation.

TABLE V-1

ALL CULTURAL MATERIALS BY EXPOSURE

BOX CANYON (35UM64)

| Location | Tools and Utilized Flakes | Cores | Debitage | FCR | Bone | Mussel Shell Valves | Totals |
|---|---|---|---|---|---|---|---|
| Surface | 10 | 9 | 58 | 15 | N/A | N/A | 91 |
| Surface Test Unit (10 cm) | 0 | 0 | 61 | 2 | 250 | 278 | 591 |
| Subsurface (All Levels) | 5** | 0 | 172 | 6 | 531 | 408* | 1,121 |
| Totals | 15 | 9 | 291 | 23 | 781 | 686 | 1,804 |

*Over 80 percent from step trench units.

**Three items from one test unit 107N/003E below Mazama ash.

N/A - Items present in low density but not collected.

TABLE V-2

ARTIFACT TYPES BY EXPOSURE

BOX CANYON

| Artifact Types | Surface | Subsurface |
|---|---|---|
| Utilized Flakes | 0 | 1 |
| Retouched Flakes | 1 | 1 |
| Cobble Biface | 7 | 0 |
| Unifacial Cobble Tool | 1 | 0 |
| Projectile Point | 0 | 0 |
| Projectile Point Fragments | 0 | 0 |
| Scraper | 0 | 0 |
| Knife Fragment | 0 | 0 |
| Core | 9 | 0 |
| Other Lithics | 1 | 1 |
| Bone Foreshaft | 0 | 1 |
| Bone Point | 0 | 1 |
| Total | 19 | 5 |

TABLE V-3

LITHIC COUNTS BY MATERIAL TYPES
(RECORDED ABSOLUTE COUNT/RELATIVE FREQUENCY)

BOX CANYON SITE

| Collection Location | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Total |
|---|---|---|---|---|---|---|---|---|
| South of 090N (Approx. Cluster 2) | 2/.013 | 111/.716 | 20/.129 | 14/.090 | 0/.000 | 3/.019 | 5/.032 | 155/.999 |
| North of 090N (Approx. Cluster 1) | 0/.000 | 9/.429 | 4/.190 | 4/.190 | 1/.048 | 1/.048 | 2/.095 | 21/1.000 |
| Total | 2/.011 | 120/.681 | 24/.136 | 18/.102 | 1/.006 | 4/.023 | 7/.040 | 176/.999 |

Surface Materials: Surface collection, surface test units, and excavation unit surface levels.

| Test Units | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Total |
|---|---|---|---|---|---|---|---|---|
| 067N/010W - 015W | 0/.000 | 46/.868 | 4/.075 | 2/.038 | 0/.000 | 1/.019 | 0/.000 | 53/1.000 |
| 107N/003W | 0/.000 | 15/.484 | 10/.323 | 2/.065 | 1/.032 | 2/.065 | 1/.032 | 31/1.001 |
| Total | 0/.000 | 61/.726 | 14/.167 | 4'.048 | 1/.012 | 3/.036 | 1/.012 | 84/4.001 |

Subsurface Materials: Combined subsurface levels (test units encountering use surface only).

TABLE V-4

BOX CANYON SITE--LITHIC DEBITAGE
(RECORDED ABSOLUTE COUNT/RELATIVE FREQUENCY)

| Collection Location | Primary | Secondary | Interior | Shatter | Blades | Total |
|---|---|---|---|---|---|---|
| South of 090N (Approx. Cluster 2) | 10/.069 | 49/.338 | 73/.503 | 10/.069 | 3/.021 | 145/1.000 |
| North of 090N (Approx. Cluster 1) | 1/.063 | 5/.313 | 6/.375 | 2/.125 | 2/.125 | 16/1.001 |
| Total | 11/.068 | 54/.335 | 79/.491 | 12/.075 | 5/.031 | 161/1.000 |

Surface Materials

| Test Units | Primary | Secondary | Interior | Shatter | Blades | Total |
|---|---|---|---|---|---|---|
| 067N/010 - 015W | 7/.219 | 9/.281 | 16/.500 | 0/.000 | 0/.000 | 32/1.000 |
| 107N/003W | 1/.031 | 6/.188 | 22/.688 | 1/.031 | 2/.063 | 32/1.001 |
| Total | 8/.125 | 15/.234 | 38/.594 | 1/.016 | 2/.031 | 64/1.000 |

Subsurface Materials (two test units only)

The flake patterns quantified in Table V-1 also suffer from problems of sample size. The same was true for color phases. As a result, the intended statistical correlation of surface to <u>in situ</u> deposits was not practical with the present data. Such comparisons may hold promise for future studies but will require larger sample sizes and/or greater technical refinement. I have presented the tables here to familiarize interested readers with the notion and for the lithic descriptions that they afford.

The first, and potentially more significant, problem was the search for intra-site patterning of cultural materials. Materials from the intact northern and southern deposits were sampled by Test Units 107N/003E and 067N/010-015W respectively. The deeper levels of the northern unit contained materials underlying Mazama ash. Middle levels sampled cultural materials from the southern unit. The results are displayed in Table V-5. Some interesting observations can be made from these data. While absolute counts are roughly equivalent, the nature of the materials exhibits marked variation. Particularly noteworthy is the variation in faunal materials from the two areas. The northern unit is dominated by fish and other bones with neglibible quantities of shell. Its pattern is reversed in the southern unit. To a lesser extent, the same pattern holds for lithic debris and tools. The southern units collectively produced six lithic items. The northern unit produced 30 flakes (one retouched) and 2 bone implements.

Cumulatively, the figures imply: (1) sampling error or resulting from sole dependence on only two test units, (2) functional partitioning within a contemporaneous occupation site, or (3) temporal and functional separation of the two areas. I tend to discount the first possibility. Materials sampled by a second test unit in the southern deposit (074N/010W) produced a similar pattern to Unit 067N/010-015W. In it were found 67 mussel valve fragments and 9 flakes. The extant data, then, tend to indicate that the predominance of shell is characteristic of the southern deposits. It is more difficult to distinguish between strict functional versus functional/temporal site partitioning. The stratigraphically higher position and absence of Mazama ash at the south contrasts with the north implies greater antiquity of the northern deposits. If so, the two areas may simply reflect re-utilization of the same area at different time for different purposes. This seems likely, though it is possible that tephra deposits at the southern section have simply eroded and are no longer visible. It is unfortunate that we were unable to obtain sufficient charcoal from the southern area for radiocarbon dating. Radiocarbon dates from the northern deposits support its pre-Mazama antiquity,[2] but the dates cannot be applied reliably to the southern material.

For the present, then, note the intriguing variation in cultural materials from the two loci within the Box Canyon site. Giving weight to the overlying lens of ash in the northern deposit implies temporal/functional stratification at the site. Strict functional separation occurring within a limited time frame cannot be discounted but seems to be less probable. In my opinion, resolution of the questions posed by intra-site partitioning holds significant potential for future research at the site.

TABLE V-5

MATERIALS COMPARISON OF TWO USE AREAS

BOX CANYON SITE

| | Below Volcanic Ash | In Semi-Stabilized Dune |
|---|---|---|
| | Unit: 107N/003E (North) Levels: 15 - 27 | Unit: 067N/015W (South) Levels: 5 - 10 |
| Bone Tools | 2 | 0 |
| Lithic Tools | 1 | 0 |
| Lithic Debitage | 29 | 5 * |
| Cores | 0 | 0 |
| Fire-Cracked Rock | 0 | 1 |
| Mammal Bone--Small & Micro | 44 | 29 |
| Mammal Bone--Medium | 1 | 1 |
| Mammal Bone--Large | 0 | 0 |
| Fish Bone | 173 | 1 * |
| Bird Bone | 0 | 1 |
| Unidentified Bone | 80 | 8 * |
| Mussel Shell Valves | 2 | 234 * |
| Other Shell | 2 | 0 |
| Egg Shell | Present | Absent |
| Charcoal | Present | Present** |
| Total | 334 | 280 |

*Note variance in these figures.

**Quantities too small for radiocarbon analysis.

## Site Comparison

The only known pre-Mazama sites in the immediate vicinity are 35UM5 (Hat Creek), and 35UM3 and 8 (both unnamed). Shiner conducted controlled excavations at Hat Creek about two miles upstream from Box Canyon, and samples 35UM3 approximately three miles downstream. Collections from these projects provide the largest sample of early cultural materials in the area (see Shiner 1961). Comparison of these materials with those collected at Box Canyon is made difficult by differences in scale of excavation and by differences in collection procedures. Shiner's materials are worth considering, however, since they plausibly can be expected to be similar to still unexcavated remains at Box Canyon.

The tables (V-6 and 7) and summary information that follow offer a descriptive comparison of Box Canyon with Hat Creek and 35UM3. Please note that I draw no necessary conclusions regarding ultimate similarity of the collections or functional relationship of the involved sites. The data are not adequate for such statements. Nonetheless, the close spatial proximity, similar environmental context, and similar temporal range of the sites warrants comparison and may provide a reasonable inductive base from which to generate more sophisticated expectations for Box Canyon materials.

Counts of faunal materials were not made available in Shiner's report. However, he reports the presence of rabbit (most abundant), deer, salmon, and bird bone at Hat Creek. He notes a low frequency of salmon relative to other sites on the Columbia, and relates this to low subsistence reliance on fish (Shiner 1961:178). The results contrast sharply with Box Canyon (see Table V-5:Below Volcanic Ash). The possibility of functional variation between contemporary sites should be investigated in any future work. Shiner does not mention mussel shell. Assuming that this implies its absence, the result is similar to pre-Mazama deposits at Box Canyon where we located only two valve fragments.

Finally, mention should be made about the apparent absence of structures at all three sites. The absence implies ephemeral shelter and/or temporary site use. As the only excavated site, Hat Creek is the only case for which the absence is really meaningful. Careful attention should be given to identification of dwelling surfaces in subsequent work. At this point, it is premature to suggest that structural remains are absent in all cases.

## Summary

Of the four Side Canyon sites studied, Box Canyon is unique in providing clear evidence of in situ cultural deposits, some of which clearly pre-date the Mazama eruption. The relatively high artifact density, despite the dune context, leaves little doubt about the presence of prehistoric occupation at Box Canyon. It may date concurrently with Shiner's Hat Creek, 35UM3 and 35UM8 sites, and appears to provide data relevant to functional and/or temporal partitioning within a limited use site. The extent to which the present results can be supported await detailed excavations at the site.

TABLE V-6

DISTRIBUTION OF FLAKES BY MATERIALS

| 35UM5* | | 35UM64 | |
|---|---|---|---|
| Material | Percent | Percent | Material |
| Basalt | 52.7 | 69.6 | Basalt |
| Crypto-Crystalline | 30.9 | 26.5 | Crypto-Crystalline<br>Andesite<br>Chert<br>Jasper<br>Opal |
| Quartite | 9.8 | 2.7 | Quartz |
| Red Ochre | 6.1 | None Observed | Red Ochre |
| Obsidian | .4 | .8 | Obsidian |
| | n = 3,000 | n = 260 | |

*Taken from Shiner 1961:175.

TABLE V-7

MATERIAL CULTURE

| Artifacts | 35UM5 | 35UM3 | 35UM64 |
|---|---|---|---|
| Projectile Points (oval w/convex base) | 10 | - | See Table V-2 |
| Projectile Points (oval w/concave base) | 2 | - | |
| Projectile Point Fragments | 33 | 1 | |
| Utilized Flakes | ? | A few | |
| Unifacial Flaked Tools (Scrapers) | 27 | 1 | |
| Unmodified Cobble Hammerstones | 5 | - | |
| Modified Cobble Choppers | 18 | A few | |
| Basalt Slab Choppers | 4 | - | |
| Polished Bone Splinters (Anvils) | 2 | - | |
| Bone Beads | 2 | - | |
| Incised Bone Fragments | 2 | 1 | |
| Groved Bone Fragments | 1 | - | |

## North Shore Sites (45BN188, 187, and 189)

### Site Structure

The three sites on the Columbia's northern shore consist primarily of surface lithic remains scattered the length of north to south running canyons. The canyons form breaks through the basalt cliffs that border this section of the river. The canyon interiors are filled with stabilized and unstabilized dune sands and extensive deflations. The surrounding cliff tops are wind scoured near the canyon edges with increased soil depth and extensive grass covers inland. Geophysical variation among the canyons is limited largely to canyon length and does not appear to affect the nature of distribution of cultural materials within them. Surface features of the canyon sites are illustrated by topographic and field maps in Chapter 3 (Figures III-2, 3, and 4) and by photographs in Chapter 2 (Figures II-5, 6, and 7).

Within the canyon, lithic materials are exposed most frequently as lag deposits in wind deflated areas. Unlike Box Canyon, the materials do not occur in dense, spatially distinct clusters. Areas of highest density, as at the mouth of Second Canyon and the lower blowout in Fourth Canyon, appear to reflect extent of deflation rather than erosion of living surfaces or concentrated use areas. Figure V-2 illustrates the extent of the deflation at the mouth of Fourth Canyon. Debris outside of the blowouts are exposed and covered again as the unstable dune surfaces shift. In the absence of basin-shaped deflations, materials do not appear to form concentrated scatters, but rather occur as isolated artifacts or fragments.

We sampled subsurface deposits only in Third Canyon (45BN188). The procedures were similar to those used in Box Canyon, modified only to the extent necessary to accommodate the particular physical properties of this canyon (refer to Chapter 3 for greater detail). As with Box Canyon, our intent was to locate and sample in situ source deposits for the surface materials. Ten test units were excavated. The only material recovered and analyzed from these units was bone (Table V-8). A total of 56 fragments was excavated, none of which appear to be a product of human activity.[2] Most of the test units were excavated in deposits with extensive rodent activity. The extent of rodent activity is well illustrated in Figure V-3. Even though our analytical procedures did not involve positive identification of bone to species, the pieces were small or fragmented enough to be accounted for by the rodent activity in deeper deposits or by slightly buried recent kills in the upper levels. While the possibility of human causes for the bone cannot be dismissed absolutely, the complete absence of other forms of cultural debris makes it highly improbable.

The initial site report for Third Canyon (Cleveland et al. 1976: 21-22) noted the possibility of two shelter remnants. The tentative identification was based on observation of semi-circular configuration of sub-angular basalt cobbles and identification of a milling stone and cobble biface. In the present project, emphasis was given to subsurface testing within these rock configurations. However, as with the other test units, no cultural materials were found.

TABLE V-8

CULTURAL ITEMS BY EXPOSURE

NORTHERN SHORE SITES

| Location | Tools and Utilized Flakes | Cores | Debitage | FCR | Bone | Mussel Shell Valves | Totals |
|---|---|---|---|---|---|---|---|
| THIRD CANYON (45BN188) | | | | | | | |
| Surface | 11 | 4 | 15 | 1 | N/A | N/A | 31 |
| Subsurface | 0 | 0 | 0 | 0 | 56 | 0 | 56 |
| Totals | 11 | 4 | 15 | 1 | 56 | 0 | 87 |
| SECOND CANYON (45BN187) | | | | | | | |
| Surface | 4 | 0 | 50 | 0 | N/A | N/A | 54 |
| FOURTH CANYON (45BN189) | | | | | | | |
| Surface | 11 | 0 | 29 | 0 | 3 (N/A) | N/A | 43 |

NOTE: N/A - In all cases, these items were present in low density but were not collected.

Fig. V-2. Fourth Canyon (45BN189) Illustrating Scale of the Deflations on the Northern Shore Sites


Fig. V-3. Test Unit in Third Canyon (45BN188) Showing Reworked Volcanic Ash and Extensive Rodent Activity Overlying Dune Sand

Fig. V-4. Arc of Stacked Basalt Cobbles. Feature Overlooking Second Canyon (45BN187).

Fig. V-5. Historic Cabin Remains in Fourth Canyon (45BN189)

In sum, the most salient feature of the subsurface tests is the complete absence of cultural remains. Based on the results of these tests, I am forced to conclude that the Third Canyon Site (45BN188) either has no subsurface archaeological deposits, consists of spatially isolated, limited use areas that were missed by the test units, and/or contained ephemeral structures that now have no remaining subsurface features. Extant cultural remains appear to be limited to a surface or immediate subsurface context. Our test excavations at Third Canyon, unlike Box Canyon, provided no basis for establishing site boundaries. Prehistoric use of Third Canyon was more diffuse resulting in relativly even dispersal of cultural materials, the most practical boundaries of which are the arbitrary limits of the canyon walls and the present shoreline of Lake Wallula. The possibility that more concentrated site loci existed on the now inundated floodplain nearer the prehistoric Columbia is quite real but cannot be investigated.

Given the physical similarity of the canyons and the similarity in surface cultural debris, I suggest that the pattern observed in Third Canyon applies to the two flanking canyons as well. If so, all three of the northern shore sites consist of surface scatters of cultural debris deposited broadly across the surface. Subsurface accumulations are likely tc be light or spatially limited. More concentrated site locations, if they exist, may have been situated further south between the canyon mouths and the now inundated prehistoric shoreline. It should be emphasized, though, conclusions are based largely on projections from the Third Canyon sample. Firm determination of site structure for Second and Fourth Canyons (45BN187 and 45BN189) must await more complete testing. Such procedures are suggested in Chapter 7 of this report.

Site Content

Cultural remains at all of the sites are dominated by lithic materials Counts of these materials are summarized in Tables V-8 and 9. The relatively small amounts reflect the paucity of debris. Considering the low overall counts, the fraction of artifacts to the total is relatively high. This artifact fraction and absence of non-lithic debris contrasts with results at Box Canyon. Furthermore, several of the implements, especially projectile points were finely made and unbroken. The condition of the points suggests loss rather than discard. The contrasts suggest use patterns different from Box Canyon. Little food processing seems to have occurred in these canyons. Instead, use may have been oriented toward food procurement, travel or other forms of intermittent use incidental to more concentrated activity elsewhere.

Mention should be made of the tentatively identified enclosures at the mouth of Third Canyon (see Cleveland et al. 1976:21-23). These semi-circular alignments of basalt were re-examined, and test units were excavated in the center. In my opinion, the results do not indicate human origin of the alignments. The alignments do not appear consistent, the previously identified milling stone proved to be a flat, but natural, basalt fracture, and the density of other cultural items does not exceed

TABLE V-9

ARTIFACT TYPES BY EXPOSURE
(No subsurface materials observed)

NORTHERN SHORE SITES

| Artifact Types | Surface | | |
|---|---|---|---|
| | 45BN188 | 45BN187 | 45BN189 |
| Utilized Flakes | 1 | 0 | 1 |
| Retouched Flakes | 0 | 0 | 0 |
| Cobble Biface | 3 | 0 | 1 |
| Unifacial Cobble Tool | 2 | 1 | 6 |
| Projectile Point | 1 | 1 | 2 |
| Projectile Point Fragments | 2 | 1 | [illegible] |
| Scraper | 1 | 0 | 0 |
| Knife Fragment | 0 | 1 | 0 |
| Core | 4 | 0 | 0 |
| Other Lithic | 1 | 0 | 0 |
| [illegible]ne Tools | 0 | 0 | 0 |
| Total | 15 | 4 | 11 |

what would be expected in a deflation of this size. Nonetheless, the enclosures were photographed and mapped for re-examination if necessary. For Third Canyon (45BN188), then, the available data suggest a site without clearly defined habitations or special features. Rather, it appears to be limited to scattered surface or immediate subsurface debris described above.

While Third Canyon appears to be exclusively a lithic site, Second and Fourth Canyons contain isolated features worthy of special note. Two stacks of subangular basalt cobbles are at the top of the cliff face immediately overlooking Second Canyon and the Columbia floodplain. The precise location is illustrated on the map in Chapter 3 (Figure III-6). Though not located within the canyon per se, the feature should be considered a part of 45BN187. One of the stacks forms an arc approximately 1.5 x 1 m across and 30 cm in height. The arc opens toward the cliff face. This feature is illustrated in Figure V-4. The second pile is smaller and circular. Neither feature exhibits fire reddening or cracking nor is charcoal or cultural debris evident. Extensive lichen accumulation on the exposed surfaces implies prehistoric origin. I do not intend to speculate extensively on function here. It should be noted, though, that location and absence of hearth indicators implies use as a cairn or special use structure. It is plausible that there are hunting blinds or wind shelters associated with hunting. Such a function would be consistent with the presence of projectile points and fragments in the canyon. In any case, the structures should be examined more thoroughly in subsequent research or as a regular part of the management process.

In Fourth Canyon are the remains of an historic cabin. Remnant features indicate the log foundation and scattered pieces of construction wood. The nature of the materials and condition of the wood suggests occupation during the 1940s through 1950s and may have been associated with sheep or cattle grazing in the area. It is located adjacent to a now overgrown road that provided a route from the mouth of the canyon to the cliff top. The position of the roads and cabin remains is illustrated on the site map in Chapter 3 (Figure III-7). Figure V-5 is a photograph of the present cabin remains. While clearly not prehistoric, the cabin is nonetheless a part of the site's cultural resources. I have included mention of it here to assist the Corps of Engineers in their management program.

## Site Comparison

North Shore Side Canyons are best compared with sites 45BN53 (Osborne 1957) and 45BN3 (Osborne 1957 and Shiner 1961). Both sites were located on Berrians Island about one mile upstream from the canyons. Both sites are now inundated by McNary Reservoir. Comparative problems between these and the three north shore sites are greater than for the Hat Creek-Box Canyon comparison on the southern shore. The paucity of material culture and absence of clear temporal markers in the Side Canyons makes relationships between these sites tenuous at best. If weight is given to temporal aspects of projectile point shape, then the material may at least overlap temporally. The small, triangular side notched points of the Side Canyons fall within the range illustrated for 45BN53. In addition, the canyons form plausible transportation routes linking the river floodplain with inland food procurement areas and may have offered unique floral or hunted resources as well.

Verne Ray's (1933) Sanpoil-Nespelem settlement subsistence pattern suggests a seasonal procurement round involving movement from aggregated village centers on the floodplain to other areas dictated by resource availability. I suggested a similar pattern for the Basin in Chapter 2. The side canyons comprise the most direct route from Sites 45BN3 and 53 northwest to the Horse Heaven Hills and beyond. Furthermore, William Dancey, in his dissertation on prehistoric land use in the Priest Rapids area (Dancey 1973) presents statistical data implying the high frequency of projectile points and hence hunting activity in "Saddle like" geophysical structures. The Side Canyons form similar structures where they intersect the bench tops. The canyons, then, may also have served as particularly productive hunting areas. This is hardly surprising since game moving between the benches and the floodplain also would be forced to use the canyon routes. Finally, Dancey (1973:33-34) argues that canyon water runoff could contribute to stands of plants, such as camas (*Camassia quamash*) not found elsewhere. Such plants could have afforded yet another resource directing floodplain populations to the canyons for temporary purposes.

It is probable that some combination of the above factors contributed to use of the Side Canyons as adjuncts to populations aggregated elsewhere. As the nearest adjacent sites, 45BN3 and 45BN53 should be considered possible sources for these populations. Site 45BN3 primarily was a burial location containing human remains, funerary goods, and some occupational debris. No dwelling structures were identified. Material artifacts include a range of stone and bone tools typical of late prehistoric settlements along the Columbia (see Shiner 1961 and Osborne 1957 for detail). Interesting exceptions include a variety of European trade goods and a relative absence of faunal material. It seems, then, that 45BN3 not only was used relatively late, but may itself be a special purpose location.

Site 45BN53 more closely fits the typical pithouse village pattern. It contained at least 183 pit structures of varying sizes. However, midden materials were relatively sparse and burials were absent. These factors may simply be results of river flood erosion. Nonetheless, a wide variety of stone and bone artifacts characteristic of late prehistoric occupations on the Columbia were removed from the site. Again the reader is advised to consult Osborne (1961) for detail. For now, note that the presence of small, triangular side notched projectile points provide the only material evidence linking the site with the Side Canyons. If use of the canyons is linked with these or to other aggregated settlements in the area, then that use terminated late and was probably limited to activities such as those suggested above.

Summary

Aside from the historic cabin and rock features noted above, the three Side Canyon Sites on the northern shore appear to be characterized by widely scattered lithic debris exposed by extensive wind erosion in these canyons. In the site subjected to subsurface sampling (45BN188), no in situ cultural deposits were found. Though tentative pending adequate test procedures, I suggest that the pattern applies equally to the remaining Side Canyon Sites. If so, the use of these canyons contrasts markedly with Box Canyon (35UM64). In Box Canyon, there is clear stratigraphic evidence of occupation areas and consequent accumulation of trash. The site's location on a bench overlooking the Columbia appears to have saved it from inundation by the filling of McNary Reservoir. Despite ongoing processes of erosion, intact cultural deposits remain. The deposits provide a clear notion of the antiquity of Box Canyon occupation and a context for evaluation of surrounding cultural debris. The three northern shore canyons, however, exhibit remains that would be expected to be deposited by less frequent, though possibly long term use. Hunting, plant gathering, and/or travel are activites that could produce remains of this nature. It is unfortunate that the prehistoric shoreline is now inundated. In the past, this would have left an additional 1/2-1 km of open space in front of the canyons. It is possible, perhaps probable, that the more concentrated site loci, such as 45BN3 and 53, were situated on the floodplain, while the canyons served primarily as transportation routes linking the river to the interior, or as hunting or other special use areas. The status of the canyons as archaeological sites is warranted, but the remains must be viewed in the context of prehistoric, rather than present, environmental conditions. Only from such a perspective can their significance be assessed adequately.

# NOTES

1. The tumbled nature of the cultural deposits in 107N/003E has an effect on the accuracy of the radiocarbon dates taken from that unit. Since we were unable to take samples from a hearth, we collected individual pieces that were retained in the screens. It is possible that some mixing occurred of temporally separate charcoal. We attempted to minimize this sort of error by avoiding areas of rodent mixing and by maintaining close vertical control (to the nearest 10 cm). In any case, our primary intent was to confirm a pre-Mazama occupation. The accuracy of the sample was adequate for this purpose and confirmed the early occupation (see below).

2. Charcoal fragments from Unit 107N/003E were given radiocarbon analysis at WSU labs. We obtained two dates, 6,320 ± 200 B.P. (WSU 2356) and 6,820 ± 200 B.P. (WSU 2357). While they show some variation, the results are within the range to be expected from these deposits and support the pre-Mazama antiquity of the northern deposits.

3. Given the size of Third Canyon, test units at 45BN188 could not sample the entire site surface. It is quite possible that isolated camping surfaces are present but were not identified by the present project. A professional search for such surfaces should accompany any future terrain disturbing activities.

# CHAPTER 6

# SIGNIFICANCE

The significance of the Side Canyon sites is best discussed in terms of their potential for archaeological research. All of the sites, to varying degrees, offer opportunities to extend our knowledge about prehistoric use of the Plateau and enhance a more general understanding of the relationships between human organization and its environmental context. In that light, it is difficult to regard any site as insignificant. All sites, small and large, fit into a region-wide, temporally dynamic picture of human existence on the Plateau. To isolate independent sites, and to restrict research focus to them, risks losing sight of the broader patterns essential to developing an understanding of prehistory. Unfortunately, there are pragmatic problems of limited funds, abilities, and desire to protect and ultimately study all of the site loci that arguably possess research significance. Within the federal system, the legal basis for site protection has come to rely on the National Register criteria for evaluation of cultural properties (36 CFR 800). It established the basic guidelines for determination of significance adequate to qualify for regulated federal protection.

In this chapter, I am bound to consider National Register criteria for assessing significance. All of the Side Canyon Sites are located on federal lands, and it is a federal agency that is charged with their final evaluation and disposition. I will argue that one site, Box Canyon, meets the criteria for eligibility. I will also discuss the significance of the remaining three sites. While not eligible for inclusion in the Register, they nonetheless possess qualities that make them important to understanding broader patterns of human prehistory in the Plateau. This chapter, then, has a dual purpose. First, to develop an assessment of the single, most important site by National Register standards. And second, to note those aspects of the remaining sites that warrant attention and protection regardless of the Register.

## Box Canyon and the National Register

In evaluating the Side Canyon Sites, the most pertinent National Register clauses are the initial requirement of site integrity and item (d) requirements dealing with information important to prehistory. I interpret the two as being separable elements of what is essentially an assessment of research potential. That is, to qualify for the Register under these criteria, a site must exhibit particular research value and contain adequately intact deposits to successfully realize that potential. Given the results of the present project, it is my opinion that the Box Canyon Site (35UM64) meets these criteria for inclusion in the National Register. Below, I consider site integrity and some of the research options that argue for such status.

The Box Canyon Site preserves two areas of cultural materials in intact geological deposits. The location and content of these deposits was discussed at length in the preceding chapter. For the present, recall that the northernmost deposit contains materials immediately predating the eruption of Mt. Mazama. The southern deposit contains materials of uncertain antiquity preserved in an apparently narrow stratum of profuse cultural debris. The two deposits are separated by a wind eroded depression that crosscuts the site from west to east. It is quite possible that this depression plus the other site deflation have destroyed site contents and thereby negatively affected site integrity. However, given the differences in elevation between the two areas, it is also possible that the two deposits reflect spatially isolated site loci. These may have been as independent in the past as they are discontinuous in the present. The issue is unresolvable. What is pertinent is simply whether or not the existing deposits contain sufficient volume to support archaeological research. Bearing in mind the limitations of the present sample size, my answer is yes. Three hundred thirty-four cultural items were removed from a total 1.2 cubic meter sample volume from the northern deposit.[1] If we conservatively estimate that volume to reflect one percent of the total recoverable remains, then it is difficult to imagine the deposit to be inadequate for scientific analyses. A total of 280 items were recovered from one cubic meter of the larger southern deposit. Assuming that this represents less than one percent of the total, the count is even higher for this area. Even with conservative estimates, then, I see no reason to exclude Box Canyon from National Register eligibility by virtue of site integrity. Extant materials appear to be fully adequate for statistical procedures necessary to a variety of research needs.

With integrity established, it simply remains to be demonstrated that significant research can be generated and pursued at the site. Below, I attempt to do so by briefly outlining several research options for Box Canyon. Bear in mind that any list of research options is bound to reflect the biases of the preparer. Furthermore, a list is static and consequently unable to accommodate new perspectives and technical refinements. Nonetheless, certain research avenues seem particularly worthy of emphasis. The ones presented below should be viewed as suggestions intended to introduce research possibilities of the Box Canyon Site. Actual research need not, and should not, be limited to them.

In dealing with early prehistory in the region, it must first be recognized that known sites are relatively rare. The handful of studies relevant to pre-Mazama periods were noted in Chapter 1 and 5 of this report. The simple fact that Box Canyon contains cultural deposits in clear stratigraphic context below Mazama ash enhances its research potential by virtue of its rarity. In addition, the close proximity of Box Canyon to other pre-Mazama sites (Hat Creek--35UM5, 35UM3, and 35UM8) enhances the value of each. Not only do we retain the ability to pursue research questions pertinent to a single site, but we additionally gain the possibility of inter-site comparison with an unusually high level of environmental control between the sites. Consequently, comparative results should be unusually free of biases attributable to variation in environmental context.

The nature of information gained from Box Canyon is potentially different from that of earlier studies. Not only are the existing studies few in number but they tend to be uniform in content and style. All are devoted primarily to descriptive accounts of sites and their material components. Such descriptions are a key element of the culture trait diffusion perspective dominant at the time. Box Canyon affords an opportunity to compliment and extend these studies into research domains that have been developed more recently. Specifically, I suggest problems of resource acquisition and its concomitant effect on site size, distribution and material content. For example, in Box Canyon the contrast between faunal remains and the associated artifact components of the two site deposits is clear (see Chapter 5). Assuming for the moment that the deposits preserve temporally distinct occupations, and that our samples adequately reflect the population, then the faunal variation implies differences in resource acquisition. The corresponding artifact variation implies a functional relationship between fluvial resources and material culture. Seldom has such a contrast been so clearly indicated in a single site. As a result, we not only have the possibility of studying the food procurement/technological relationship for early sites, but we may have the ability to study a change in that relationship through time.

Additional procurement/material culture comparisons between Box Canyon and other sites on the Columbia could be pursued as well. Virtual absence of fire-cracked rock at Box Canyon was noted in the preceding chapter. A comparison of Box Canyon remains with other riverine sites in which stone cooking is predominant should lead to rather straight forward conclusions about the relationship between the requirements imposed by variations of food extraction, processing, and sedentism on the material culture of the groups involved. The conclusions, furthermore, would be ones that need not rely on diffusion of material traits but rather draw a direct link between environmental constraints and related material culture. From present data, it is equally possible that the intra-site partitioning at Box Canyon reflects a functional rather than temporal distinction. Development of the research capacity to discriminate between the alternative possibilities presents both a research problem and opportunity for the site. The analytical ability to establish functional distinctions, or temporal variation in the absence of direct stratigraphic control, is still not well developed. Initial data from the site indicate an unusually clear materials and faunal distinction between the two deposits. As a result, we may have a corresponding, unusually good chance to refine our analytical skills to discriminate such distinctions.

Other technical refinements may also be pursued at Box Canyon. In the preceding chapter, for example, I discussed my attempts to relate materials from surface deposits to subsurface remains. I argued that such efforts may be useful in deflated sites where extensive remains occur as lag deposits without normal stratigraphic control. While my efforts suffered from inadequate sample size, similar efforts at a larger scale may obtain more satisfactory results. To be useful, of course, such procedures would have to be applicable at sites away from Box Canyon. At present I cannot predict the success or long-term utility of such procedures. They are worthy of mention, however, to further illustrate another aspect of research possible at the site.

For Box Canyon, then, I have stressed research relevant to early prehistory of the Plateau, a shift in perspective of that research, the unique possibilities of the site for comparative research, the potential to pursue problems of intra-site temporal/spatial partitioning, and the possibilities of technical refinement in relating surface to subsurface remains. The range of research, of course, could be much broader. I have stressed these few research options as ones that seem particularly well suited to the site. In my opinion, the importance of such research domains and the potential of the site to study them are fully adequate to qualify the Box Canyon Site for nomination to and inclusion in the National Register of Historic Places.

## Significance of North Shore Sites

Arguments for significance of the south shore sites are not as strong as those for Box Canyon. Judging from observations from the present project, it would be difficult to build an argument for inclusion in the Register. The apparent absence of subsurface remains or surface features hinders our ability to develop research options likely to be considered important by National Register standards. This does not mean, however, that the sites should be casually dismissed. First, note the apparent lack of subsurface materials at sites 45BN187 and 45BN189 was a projection of results from the center canyon--Third Canyon (45BN188). Furthermore, the great size of Third Canyon forced widely spaced test units. It is possible that the tests failed to locate spatially limited camp surfaces. It is possible, then, that unidentified limited surface or ephemeral sites exist within the Side Canyons. Though present data suggest not, the limitations of those data should be recognized and final determination withheld in the absence of firmer data for the untested canyons.

Bearing in mind the above limitations, it is nonetheless my opinion that the three northern shore canyons have been accurately described. That is, the sites are as they appear, focal points along the river shore of surface accumulated debris--primarily lithic debris. Temporary camp locations are probable but, as yet, undiscovered. Accepting this status for the present, we are still left with the question of site importance. Are we to limit professional attention only to concentrated use and living surfaces, or can we find value in less dramatic sites such as these? If we accept the importance of broader questions of human exploitation of the Plateau, then we are compelled to attempt to understand all archaeological sites though different kinds of funding and effort may be afforded them. The North Shore Canyon Sites are no exception. Given the geomorphology of the area and canyons, coupled with the character of materials and their distribution in the canyons, the canyons may have served several functions for human occupants of the area. In the preceding chapter, I suggested that the Side Canyons functioned as transportation routes, hunting, and/or plant extraction areas associated with primary use of the floodplain. As transportation routes, the canyons would have linked the Horse Heaven Hills with the resource potential of the river. A mobile population, forced to exploit more than a single resource zone would have been channeled through these canyons in order to reach the shore. Debris scattered the length of the canyon would be an expected result of such travel over an extended period of time. Alternative or additional use as hunting areas is implied by the high fraction of lithic debris and intact artifacts (especially projectile points). The possible use of the rock features overlooking Second Canyon as hunting blinds would clearly fit a hunting utilization pattern. Finally, the tendency of canyons to channel rain water falling on the bench tops enhances the possibility that otherwise unexpected vegetal resources, such as camas, may have been found on the canyon floors. The fact that unique plant stands were not observed during the research may simply reflect the late autumn season, and present overgrazed and off-road vehicle abused state of the canyon surfaces. Efforts should be made to enhance our ability to reconstruct past plant communities from present data. As the largest of the canyons, Fourth Canyon perhaps holds the greatest potential for preserving remnants of such communities. The possibility enhances its potential research value.

In short, the North Shore Side Canyon Sites are not unimportant to the prehistory of the region. Research options dealing with the transportation and resource extraction functions suggested above could be productively pursued using the Northern Shore Sites as part of a regional research design. It is important that such research not be undertaken with a limited, site specific focus. The use patterns that I have suggested fit into a broad picture of resource use and human mobility across the Plateau. Research problems dealing with such macroscopic questions could make use of information from the Canyon Sites but cannot be productively limited to them. The fact that the Canyons lack demonstrated use surfaces fits the expected regional use pattern and makes them no less important to such broad-scale issues. Indeed, the expectations given would be weakened if the Canyons appeared otherwise. I argue, then, that the North Shore Sites are important cultural resources. I urge that the sites be protected to the maximum extent possible despite absence of National Register status. Management suggestions for these sites, as well as for Box Canyon, are offered in the following chapter.

In sum, the four Side Canyon Sites display characteristics that imply different evaluations of significance. Site 35UM64 (Box Canyon) contains intact cultural deposits relating to one or two distinct occupational phases. The site is of relatively great antiquity and consequently preserves cultural remains uncommon on the Plateau. The integrity and research potential of the site fully warrants nomination to the National Register of Historic Places. Sites 45BN187, 188, and 189 (Second, Third, and Fourth Canyons) are important for the information they can provide regarding prehistoric mobility and hunting patterns, and plant extraction on the Columbia Plateau. The sites do not appear to contain deposits that meet National Register requirements. Nonetheless, they are important cultural properties that warrant preservation by the U.S. Corps of Engineers and further study if protection becomes impossible.

NOTES

1. This sample volume represents the culture bearing deposits below Mazama ash, not the entire test unit. Both the northern and southern counts are displayed in Figure V-6 of Chapter 5.

# CHAPTER 7

# SITE INTEGRITY AND MANAGEMENT

The physical status of all of the sites has been stressed throughout the report. Site integrity for Box Canyon was discussed in the preceding chapter. Perhaps the most salient characteristic of all of the canyons is the predominance of unstabilized and semi-stabilized dune sands. Indeed, it is this characteristic that at once exposes the sites to a degree of scientific scrutiny and is their chief natural source of ongoing deterioration. Through maps and text in previous chapters, the current state of site preservation should be clear. Rather than reiterate the previous descriptions here, I intend to discuss continuing and future sources of impacts to site integrity. Following this discussion, I suggest management options to minimize site destruction and consequent research losses.

## Ongoing and Anticipated Impacts

From the initial reconnaissance reports, it was clear that surface cultural materials were sparse, fragile, and already undergoing gradual transformation from natural erosion. The present study confirms the pattern. This implies that not only must great care be taken in recovery and analyses in any future archaeological projects, but that available cultural remains could be lost through acceleration of natural or human induced erosion. Current and potential adverse impacts to the Side Canyon Sites appear to fall into four categories: (1) continuing wind deflation, (2) destruction from off-road vehicle travel, (3) vandalism, and (4) losses to future construction projects.

Wind action on the Side Canyon sediments is hardly a recent phenomenon. Dune formations appear to have characterized the physiography of the canyon interiors for several millenia (c.f. Chapter 4 in this volume, and Cleveland et al. 1976:24). The Box Canyon Site appears to be situated on old dune structures, was buried by newer ash and dunes, and is presently being exposed by continuing wind action on the sand. The dunes in Box Canyon, as in all of the canyons, result from the often severe, predominantly westerly winds blowing up the Columbia. These winds scour exposed areas and deposit air borne sediments in places, like the side canyons, where obstructions cause turbulence or slow the air flow. The characteristic arc of dune sand at the eastern edge of the northern canyon sites (see Figures II-6 and VII-1) is a product of this process. Of present concern is the rate at which cultural materials are currently being exposed and projected changes in that rate.

There is no doubt that changes are occurring in the surface exposure of cultural items. Extensive deflations, and in the northern shore canyons, recent dune formations characterize the site surfaces. Figure II-6 illustrates the deflation and dunes in Third Canyon, and Figure II-4 shows the Box Canyon Site and some of its deflated areas. Exposure of cultural materials varies with the weather. For example, objects located by pin flags early in the project were often covered by moving sand while other, previously obscured items, were exposed. It is clear, too, that artifacts are being gradually sorted toward the center of the deflated areas, obscuring the spatial relationship between elements. However, the rate at which the changes are occurring is not certain. Aerial photographs taken in 1944 and 1978 (see Figures II-2 and II-3 in Chapter 2) both show dune formations, but the precise relationship of deflation and dunes cannot be seen. For the present, it must be assumed that deflation and deposition is a long standing process in the side canyons that is, to an unknown extent, eroding and altering the context of cultural resources in the side canyons. The processes will almost certainly continue into the future. Complete contour maps were prepared for the Box Canyon and Third Canyon Sites, in part, to provide a base line from which changing site physiography may be monitored. I suggest that the canyons be re-examined at a later date to provide the diachronic perspective necessary to adequately discuss rates of deflation impact.

A recent development accelerating the loss of dune vegetation, and hence the rate of wind erosion, is the increased popularity of off-road vehicles. Tracks are evident in all of the canyons (see Figure VII-2). The defoliated areas that result are highly subject to wind loss. Unless off-road travel decreases, the gradual erosion processes that held until the present can be expected to shift to more radical erosion.

Vandalism is not yet a severe problem at the sites. There was clear evidence of only one excavated hole at the Box Canyon Site. This undoubtedly reflects the general paucity of cultural debris at the sites. With better picking elsewhere, collectors seem disinclined to spend a great deal of effort on the Side Canyons. Nonetheless, digging at a fragile site such as Box Canyon, and the ever present arrow head collectors can have a marked impact on sites where cultural materials are limited and already highly eroded.

By far the greatest potential danger to the Side Canyon Sites in this section of the Columbia is the construction of pump station irrigation projects. Large-scale irrigated agriculture has become an increasingly dominant feature of the region since the completion of McNary Dam. Given increasing national emphasis on agricultural intensification, agricultural operations should continue to expand across the river terrace tops where soils and slope permit. Water is made available for crops by building electric pump stations at the river margins and pumping the water through large concrete and steel pipelines to the fields. Side canyons in the terrace cliffs provide the easiest access routes to the potential fields. Trenches for these pipes are excavated by heavy earthmoving equipment. The terrain disturbance in the construction area is substantial. Figures VII-3 and 4 show pump station construction and pipeline trenching in progress approximatley one mile downstream from Second Canyon. A notion of scale may be gained by comparing the size of the trailer and diesel shovel with the surrounding earth mounds. At this time, no construction of the same nature has taken place in any of the side canyons considered in this report. If such construction is planned, careful management will be needed to avoid or minimize destruction of archaeological materials.

Fig. VII-1. Dune Ridge Formation at Third Canyon (45BN188). Photo Facing North.

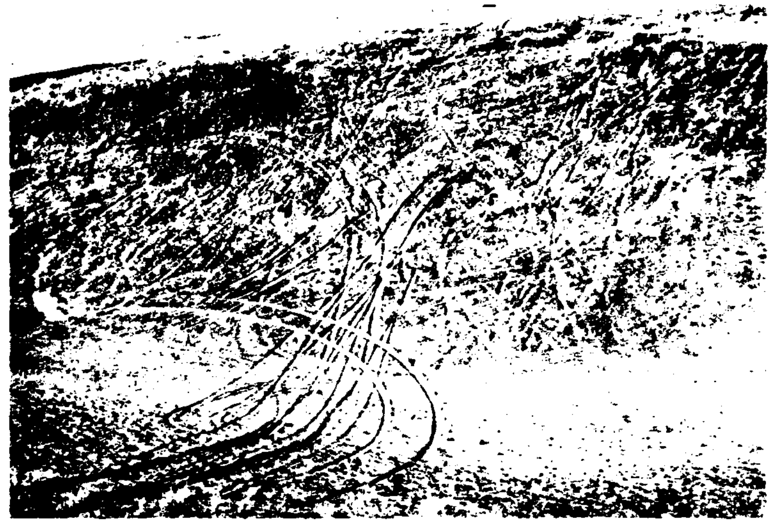


Fig. VII-2. Off-Road Vehicle Tracks at Second Canyon (45BN187)

Fig. VII-3. Construction of Irrigation Pump Station near Second Canyon (45BN187)

Fig. VII-4. Pipeline Trenching for Pump Station Irrigation Project--Northern Shore of McNary Reservoir, 1979

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TEST EXCAVATIONS AT BOX CANYON AND THREE OTHER SIDE CANYON SITE--ETC(U)
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## Management

### Box Canyon (35UM64)

Preservation. For Box Canyon, as for all of the Side Canyon Sites, I urge preservation. Preservation is the least costly and for the present, the most effective management tool at the disposal of most federal agencies. It recognizes pragmatic limitations of funds for adequate research-oriented excavation in the absence of massive immediate impacts to site integrity. Furthermore, if carefully administered, preservation could be maintained through current staff functions and relatively small expenditures.

Of all the sites studied, the Box Canyon Site is arguably the most worthy of immediate protective measures. It not only contains cultural deposits in stratigraphic context, but contains materials of an antiquity rarely researched on the Plateau. However, the volume of intact deposits is limited. If allowed to continue, erosion can seriously impact a valuable resource. I suggest that a protective program be implemented to counter site impacts in each of the four areas discussed above. Specifically, I suggest the following:

(1) Wind deflation: Deflation could be slowed or halted by erection of inexpensive wind fences and completion of a revegetation program. Much of the ongoing erosion is caused by westerly winds that flow up the Columbia and channel between the higher north and south deposits of the site. A wind-tunnel affect is created that scours the site center. Related turbulence maintains the large deflation southeast of the southern deposit. Figure VII-5 illustrates the predominant wind patterns. Wind fences located to intercept the air flow should effectively slow this erosion. On Figure VII-5 I have indicated locations I feel would be the most effective in disrupting the wind flow. If the wind can be slowed, then revegetation should present little difficulty. Locally-adapted grasses, planted to take advantage of winter moisture, should virtually halt the remaining natural deterioration of the site. Maintenance of the fence and vegetation would require some effort but hopefully would not exceed capacities of the agency.

(2) Off Road Vehicle Use: Motorcycles present the clearest danger in this category. During the field season, one cyclist saw fit to try his skills on the site slopes. The resulting damage was dramatic. For preservation to be effective such damage would have to be stopped. For the present, I suggest placement of vehicle restriction signs, periodic patrolling, and/or construction of a fence across the access points to the site. Since steep embankments border each side of the site, the total distance to be fenced would be relatively short (approximately 600 meters). Even though fences occasionally engender special attention and animosity, the public notice of use of the site as a "revegetation area" coupled with abundant alternative off-road areas should minimize hostile destruction.

(3) Vandalism: A single point on the southwestern edge of the northern deposit showed signs of artifact digging. Since most of the cultural deposits at Box Canyon are deep and/or contain relatively "uninteresting"

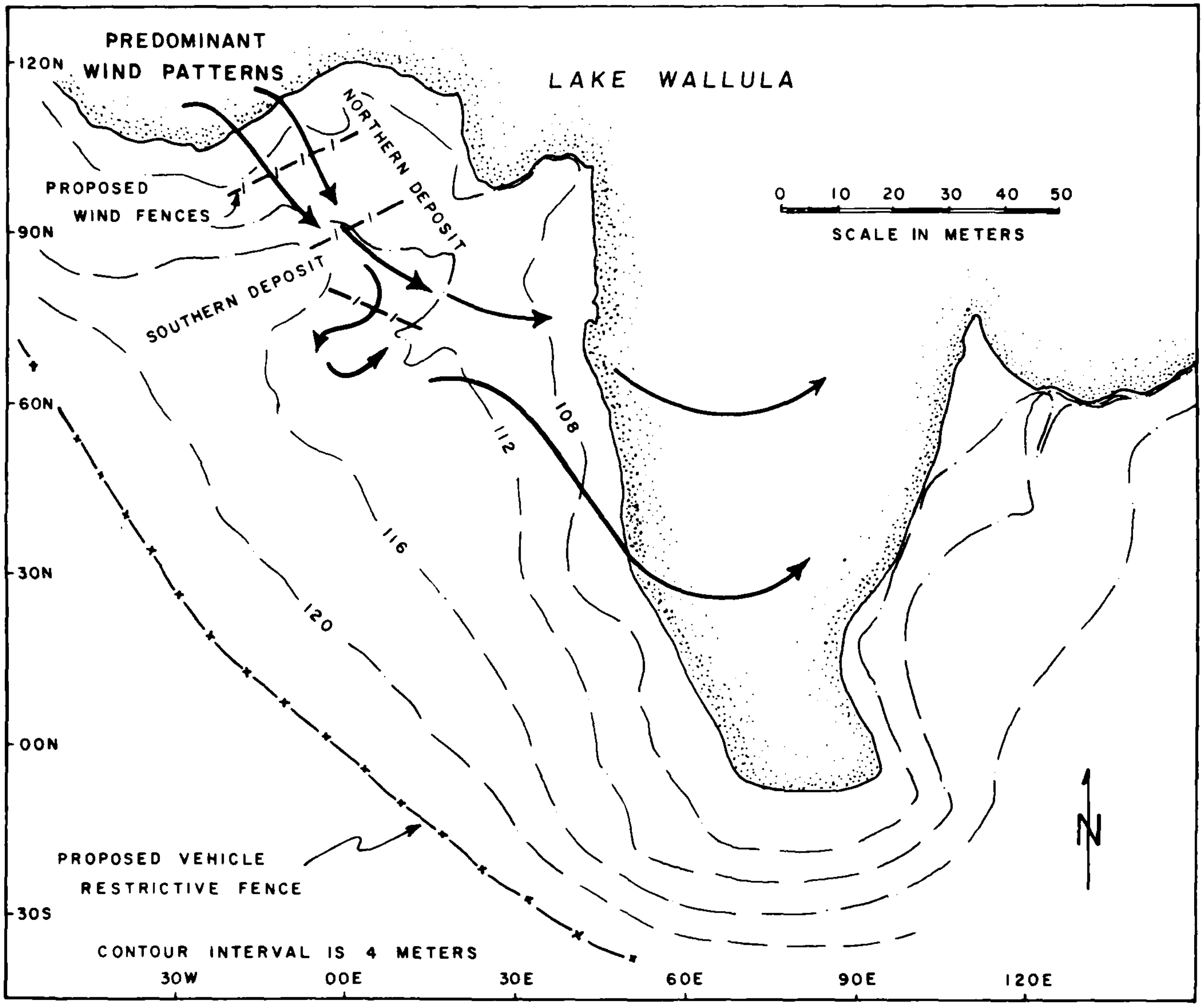


Fig. VII-5. Wind Flow Patterns and Erosion Controls at Box Canyon (35UM64) artifacts for casual collectors, site vandalism may not be a major problem. Patrolling may be the only protective means available. The Corps of Engineers may also wish to use signs, though discretion is advisable. It is arguable that "Cultural Resources" signs are actually counterproductive in that they draw attention to archaeological sites that would otherwise not be noticed and thereby invite vandalism. However, a simple sign at the site margins or an alternative "Revegetation" sign may help discourage the more civic-minded relic collectors.

(4) Construction Projects: Any major construction on the western side of the canyon would severely impact the site. I urge avoidance of any major terrain disturbing activities. If such activities are unavoidable, efforts should be made to restrict them to the eastern side. If, despite the cultural resources, activities are permitted on the western side of the canyon, it is important that carefully structured archaeological research precede the work. Box Canyon Site is a valuable resource worthy of protection, or careful study should protection prove impossible. Mitigation should be carefully conceived and thoroughly executed.

Mitigation. The mitigation of impacts through site excavation should be a last choice option. Provided erosion retarding measures are taken, it should only be necessary in the face of major construction in the canyon. It is not my intent to detail research procedures here. Several options were suggested in the preceding chapter. Furthermore, that research will have to be structured to suit the needs extant at the time of excavation. I suggest, however, that further sampling of the site is unwarranted. In my opinion, the remaining deposits are so limited that additional sampling designs would further damage the site without significantly enhancing our understanding of the cultural processes that produced it. Any additional work should be an intensive excavation of the entire site. The basic data now available are adequate to generate research designs to guide excavations. Future excavation, if undertaken, should proceed to this next logical phase and funds should be made available to pursue it adequately.

The North Shore Sites (45BN188, 45BN187, and 45BN189)

Preservation. The three northern shore sites also warrant protection. If possible, these sites should be preserved in a manner similar to Box Canyon. I am aware, however, that the greater overall size of these canyons would make such procedures more difficult and more costly. The measures suggested for Box Canyon may be selectively implemented to the extent that they are practical at these sites. Minimally, I suggest the following.

(1) The placement of signs restricting off-road vehicle travel in the canyons. Such travel appears to be a major source of the continuing deterioration of canyon vegetation. Where practical, fencing to limit access would be helpful. Indeed, any means to eliminate vehicle abuse of the canyons would help retard erosion. It is unrealistic to expect significant revegetation as long as such use continually destroys it.

(2) Instigation of regular patrols to better enforce vehicle restrictions and to discourage artifact collection. Again, the use of

"Cultural Resource" signs to assist enforcement of anti-collection policies is left to the discretion of the Corps of Engineers, though I fear that they may be counterproductive.

(3) Monitoring of the rate of change in the dune surfaces would assist in future decisions regarding preservation of natural vegetation in the canyons. Topographic maps and photographs can provide the reference point from which to assess continuing erosion. Later comparative photographs should be used to monitor rate of erosion or revegetation.

(4) The rock features near Second Canyon and the historic cabin in Fourth Canyon should be given particular attention and protection until they can be adequately investigated. For the present, regular patrols should be adequate. However, since these features, particularly the rock features, may represent an unusual heritage value, care should be taken to insure their integrity.

(5) Other protective measures such as the construction of wind fences and planned revegetation programs certainly would be desirable. Given the extent of the work necessary, the implementation of such procedures seems unlikely. However, if funds and personnel are available, stabilization procedures would be a valuable extension of the minimal measures listed above. I urge that they be pursued to maximum extent possible.

Mitigation. The most severe, and perhaps most probable, impact to the sites would be the construction of pump station projects in the canyons. Figure VII-4 illustrates the extent of disruption such projects entail. If possible, such destruction should be avoided. However, if construction permits are granted, steps should be taken to protect the canyons' cultural materials. Given the paucity of cultural materials located by the test excavations in Third Canyon (45BN188), it does not seem practical to require intensive excavation in advance of work. Nonetheless, I urge that sampling programs be discussed and carried out in advance of any construction. If site loci are found, then excavation of those areas should be required. In any case, ongoing construction should be monitored by professional archaeologists. If site surfaces are encountered, a pre-established excavation plan should be quickly implemented to minimize information loss from the site. It should be kept in mind that such work would compromise research quality. I suggest it here as a pragmatic approach to be followed only for these sites; sites for which we were unable to demonstrate a research significance equal to that of Box Canyon. If more thorough regional research is possible, then by all means, it should be implemented. However, for the present, greatest effort should be directed toward preservation and alternatives to site destruction. In the long run, these procedures are the more economical and the most effective means of maintaining irreplacable resources such as these.

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APPENDIX A-1

SUMMARY DATA TABLES

Box Canyon Site (35UM64)

Prepared by

Eileen Adams-Rasmussen

LITHIC DEBITAGE

Surface Collections

| 30m x 30m Unit | Primary | Secondary | Interior | Shatter | Blades | Totals |
|---|---|---|---|---|---|---|
| N090/W000 | 0 | 3 | 3 | 1 | 2 | 9 |
| N090/E000 | 1 | 1 | 3 | 1 | 0 | 6 |
| N090/E030 | 0 | 1 | 0 | 0 | 0 | 1 |
| N060/W000 | 1 | 8 | 4 | 0 | 0 | 13 |
| N060/E000 | 2 | 7 | 0 | 2 | 1 | 12 |
| N060/E030 | 1 | 3 | 1 | 0 | 0 | 5 |
| N030/W000 | 1 | 1 | 0 | 0 | 0 | 2 |
| N030/E000 | 2 | 3 | 2 | 0 | 1 | 8 |
| N030/E030 | 0 | 0 | 1 | 0 | 0 | 1 |
| N000/E000 | 0 | 1 | 0 | 0 | 0 | 1 |

LITHIC DEBITAGE

Surface Test Units

| 1m x 1m Unit | Primary | Secondary | Interior | Shatter | Blades | Totals |
|---|---|---|---|---|---|---|
| N105/E011 | - | - | - | - | - | 0 |
| N069/E011 | - | 7 | 38 | 1 | - | 46 |
| N068/W007 | - | 4 | 5 | 6 | - | 15 |

LITHIC DEBITAGE

Excavation Test Units

| 1m x 1m Unit | Level | Primary | Secondary | Interior | Shatter | Blades | Totals |
|---|---|---|---|---|---|---|---|
| N107/E003 | 13 | - | 1 | 1 | - | 1 | 3 |
| | 20 | - | - | 3 | - | 1 | 4 |
| | 21 | - | - | 3 | - | - | 3 |
| | 22 | - | - | 7 | - | - | 7 |
| | 23 | 1 | 1 | 3 | 1 | - | 6 |
| | 24 | - | - | 4 | - | - | 4 |
| | 25 | - | 2 | - | - | - | 2 |
| | 26 | - | 2 | - | - | - | 2 |
| | 27 | - | - | 1 | - | - | 1 |
| Totals | | 1 | 6 | 22 | 1 | 2 | 32 |
| N106/E003 | 3 | - | - | 1 (utilized) | | - | 1 |
| | 4 | - | - | 1 | - | - | 1 |
| Totals | | 0 | 0 | 2 | 0 | 0 | 2 |
| N098/E007 | 5 | - | - | 1 | - | - | 1 |
| Totals | | 0 | 0 | 1 | 0 | 0 | 1 |
| N074/W016 | S1 | - | 1 | 1 | - | - | 2 |
| | 6 | - | 1 | 1 | - | - | 2 |
| | 7 | - | - | 1 | - | - | 1 |
| | 8 | - | - | 1 | - | - | 1 |
| | 9 | - | 2 | - | - | - | 2 |
| | 10 | - | - | 1 | - | - | 1 |
| | 11 | 1 | 1 | - | - | - | 2 |
| | 13 | - | - | 2 | - | - | 2 |
| Totals | | 1 | 5 | 7 | 0 | 0 | 13 |
| N074/E028 | S1 | - | 1 | 3 | - | - | 4 |
| | 2 | - | - | 6 | - | - | 6 |
| Totals | | 0 | 1 | 9 | 0 | 0 | 10 |
| N067/W010 | S1 | | 10 | 2 (and 1 water-worn unknown) | | | 13 |
| | 2 | 5 | 3 | 2 | - | 1 | 11 |
| | 3 | - | 1 | 1 | - | - | 2 |
| | 4 | - | - | 2 | - | - | 2 |
| | 5 | - | - | 1 | - | - | 1 |
| Totals | | 5 | 14 | 8 | (1) | 1 | 29 |
| N067/W011 | 2 | - | 1 | 1 | - | - | 2 |
| | 3 | 1 | - | 1 | - | - | 2 |
| Totals | | 1 | 1 | 2 | 0 | 0 | 4 |

LITHIC DEBITAGE

Excavation Test Units

| 1m x 1m Unit | Level | Primary | Secondary | Interior | Shatter | Blades | Totals |
|---|---|---|---|---|---|---|---|
| N067/W012 | S1 | 1 | 1 | 3 | - | 1 | 6 |
| | 2 | - | - | 1 | - | - | 1 |
| | 3 | - | - | 2 | - | - | 2 |
| | 4 or 5 | - | - | 1 | - | - | 1 |
| Totals | | 1 | 1 | 7 | 0 | 1 | 10 |
| N067/W013 | 4 | - | 1 | 1 | - | - | 2 |
| Totals | | 0 | 1 | 1 | 0 | 0 | 2 |
| N067/W014 | S1 | 1 | 2 | 1 | - | - | 4 |
| | 2 | - | 1 | - | - | - | 1 |
| Totals | | 1 | 3 | 1 | 0 | 0 | 5 |
| N067/W015 | 7 | - | 1 | - | - | - | 1 |
| | 8 | 1 | - | 2 | - | - | 3 |
| | 9 | - | 1 | - | - | - | 1 |
| Totals | | 1 | 2 | 2 | 0 | 0 | 5 |
| N067/E011 | S1 | 1 | - | 9 | - | - | 10 |
| | 2 | - | - | 6 | - | - | 6 |
| | 3 | - | 1 | 5 | - | - | 6 |
| | 4 | 1 | 1 | 4 | - | - | 6 |
| | 5 | 1 | - | 5 | - | - | 6 |
| | 6 | - | - | 4 | - | - | 4 |
| Totals | | 3 | 2 | 33 | 0 | 0 | 38 |
| N056/E111 | - | - | - | - | - | - | 0 |
| Totals | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N054/W011 | S1 | - | - | 3 | - | - | 3 |
| | 2 | - | - | 1 | - | 1 | 2 |
| | 3 | - | - | 1 | - | 1 | 2 |
| | 4 | - | - | 7 | - | 1 | 8 |
| | 5 | - | - | - | - | 1 | 1 |
| | 6 | - | - | 2 | - | - | 2 |
| Totals | | 0 | 0 | 14 | 0 | 4 | 18 |
| N033/E002 | 3 | 1 | - | - | - | - | 1 |
| | 6 | - | 1 | 1 | - | - | 2 |
| Totals | | 1 | 1 | 1 | 0 | 0 | 3 |
| N025/E120 | - | - | - | - | - | - | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

LITHIC RAW MATERIALS

Surface Collections

| 30m x 30m Unit | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Totals |
|---|---|---|---|---|---|---|---|---|
| N090/W000 | 0 | 6 | 2 | 1 | 1 | 1 | 2 | 13 |
| N090/E000 | 0 | 1 | 2 | 3 | 0 | 0 | 1 | 7 |
| N090/E030 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| N060/W000 | 1 | 15 | 2 | 2 | 0 | 1 | 3 | 24 |
| N060/E000 | 1 (granite) | 8 | 4 | 1 | 0 | 0 | 1 | 15 |
| N060/E030 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 6 |
| N030/W000 | 1 (flaked glass) | 1 | 0 | 0 | 0 | 2 | 0 | 4 |
| N030/E000 | 0 | 5 | 1 | 1 | 0 | 0 | 1 | 8 |
| N030/E030 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| N000/E000 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |

LITHIC RAW MATERIALS

Surface Test Units

| 1m x 1m Unit | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Totals |
|---|---|---|---|---|---|---|---|---|
| N105/E011 | - | - | - | - | - | - | - | 0 |
| N069/E011 | - | 31 | 6 | 9 | - | - | - | 46 |
| N068/W007 | - | 5 | 5 | - | - | - | - | 10 |

## LITHIC RAW MATERIALS

### Excavation Test Units

| lm x lm Unit | Level | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Totals |
|---|---|---|---|---|---|---|---|---|---|
| N107/E003 | 13 | - | 2 | - | 1 | - | - | - | 3 |
| | 20 | - | 4 | - | - | - | - | - | 4 |
| | 21 | - | 1 | 2 | - | - | - | - | 3 |
| | 22 | - | 4 | 2 | - | - | 1 | - | 7 |
| | 23 | - | 3 | 2 | - | - | 1 | - | 6 |
| | 24 | - | 1 | 3 | - | - | - | - | 4 |
| | 25 | - | - | - | - | 1 | 1 | - | 2 |
| | 26 | - | - | 1 | - | - | - | 1 | 2 |
| | 27 | - | - | - | 1 | - | - | - | 1 |
| Totals | | 0 | 15 | 10 | 2 | 1 | 3 | 1 | 32 |
| N106/W003 | 3 | - | 1 | - | - | - | - | - | 1 |
| | 4 | - | 1 | - | - | - | - | - | 1 |
| Totals | | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| N098/E007 | S1 | - | 1 | - | - | - | - | - | 1 |
| | 5 | 1 | - | - | - | - | - | - | 1 |
| Totals | | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 |
| N074/W016 | S1 | - | 2 | - | - | - | - | - | 2 |
| | 6 | 1 | 1 | - | - | - | - | - | 2 |
| | 7 | - | 1 | - | - | - | - | - | 1 |
| | 8 | - | 1 | - | - | - | - | - | 1 |
| | 9 | - | 2 | - | - | - | - | - | 2 |
| | 10 | - | 1 | - | - | - | - | - | 1 |
| | 11 | - | 2 | - | - | - | - | - | 2 |
| | 13 | - | 2 | - | - | - | - | - | 2 |
| Totals | | 1 | 12 | 0 | 0 | 0 | 0 | 0 | 13 |
| N074/E028 | S1 | - | 4 | - | - | - | - | - | 4 |
| | 2 | - | 4 | 1 | 1 | - | - | - | 6 |
| Totals | | 0 | 8 | 1 | 1 | - | - | - | 10 |
| N067/W010 | S1 | - | 12 | 1 | 1 | - | - | - | 14 |
| | 2 | - | 10 | 1 | - | - | - | - | 13 |
| | 3 | - | 1 | 1 | - | - | - | - | 2 |
| | 4 | - | 2 | - | - | - | - | - | 2 |
| | 5 | - | 1 | - | - | - | - | - | 1 |
| Totals | | 0 | 26 | 3 | 1 | 0 | 0 | 0 | 32 |
| N067/W011 | 2 | - | 2 | - | - | - | - | - | 2 |
| | 3 | - | 2 | - | - | - | - | - | 2 |
| Totals | | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 |

## LITHIC RAW MATERIALS

### Excavation Test Units

| 1m x 1m Unit | Level | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Totals |
|---|---|---|---|---|---|---|---|---|---|
| N067/W012 | S1 | - | 5 (and 1 micaceous sandstone) | | | | 1 | - | 7 |
| | 2 | - | 1 | - | - | - | - | - | 1 |
| | 3 | - | 1 | - | 1 | - | - | - | 2 |
| | 4 or 5 | - | 1 (from slumped area) | | | - | - | - | 1 |
| Totals | | 0 | 9 | 0 | 1 | 0 | 1 | 0 | 11 |
| N067/W013 | 4 | - | 2 | - | - | - | - | - | 2 |
| Totals | | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| N067/W014 | S1 | - | 4 | - | - | - | - | - | 4 |
| | 2 | - | 1 | - | - | - | - | - | 1 |
| Totals | | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 5 |
| N067/W015 | 7 | - | 1 | - | - | - | - | - | 1 |
| | 8 | - | 3 | - | - | - | - | - | 3 |
| | 9 | - | - | 1 | - | - | - | - | 1 |
| Totals | | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 5 |
| N067/E011 | S1 | - | 9 | - | - | - | - | 1 | 10 |
| | 2 | - | 3 | 2 | - | - | - | 1 | 6 |
| | 3 | - | 3 | 1 | 2 | - | - | - | 6 |
| | 4 | - | 3 | 1 | - | - | - | 2 | 6 |
| | 5 | - | 4 | - | - | - | - | 2 | 6 |
| | 6 | - | 2 | 2 | - | - | - | - | 4 |
| Totals | | 0 | 24 | 6 | 2 | 0 | 0 | 6 | 38 |
| N056/E111 | | - | - | - | - | - | - | - | 0 |
| Totals | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N054/W011 | S1 | - | 2 | 1 | - | - | - | - | 3 |
| | 2 | - | 2 | - | - | - | - | - | 2 |
| | 3 | - | 2 | - | - | - | - | - | 2 |
| | 4 | - | 7 | 1 | - | - | - | - | 8 |
| | 5 | - | - | 1 | - | - | - | - | 1 |
| | 6 | - | 2 | - | - | - | - | - | 2 |
| Totals | | 0 | 15 | 3 | 0 | 0 | 0 | 0 | 18 |
| N033/E002 | 3 | - | 1 | - | - | - | - | - | 1 |
| | 6 | - | 2 | - | - | - | - | - | 2 |
| Totals | | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| N025/E111 | | - | - | - | - | - | - | - | 0 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## FIRE-CRACKED ROCK COUNTS AND WEIGHTS

### Surface Collections

| Unit | #FCR | Weight (Kg) |
|---|---|---|
| N090/W000 | 2 | 772.3 |
| N090/E000 | 0 | |
| N090/E030 | 0 | |
| N060/W000 | 7 | 2,221.7 |
| N060/E000 | 5 | 938.5 |
| N060/E030 | 0 | |
| N030/W000 | 0 | |
| N0e0/E000 | 0 | |
| N030/E030 | 1 | 19.0 |
| N000/E000 | 0 | |

### Surface Test Units

| Unit | #FCR | Weight (Kg) |
|---|---|---|
| N105/E011 | 0 | |
| N069/E011 | 2 | 58.3 |
| N068/W007 | 0 | |

### Excavation Test Units

| Unit | #FCR | Weight (Kg) |
|---|---|---|
| N106/E003 | 0 | |
| N098/E007 | 0 | |
| N074/W016 | 0 | |
| N074/E003 | 0 | |
| N074/E028 | | |
| Level S1 | 3 | 155.7 |
| N067/W010 | 0 | |
| N067/W011 | 0 | |
| N067/W012 | 0 | |
| N067/W013 | 0 | |

| Unit | #FCR | Weight (Kg) |
|---|---|---|
| N067/W014 | 0 | |
| N067/W015 | | |
| Level 8 | 1 | 108.1 |
| N067/E011 | | |
| Level 5 | 1 | 134.8 |
| Level 6 | 1 | 87.9 |
| N056/E111 | 0 | |
| N054/W011 | 0 | |
| N033/E002 | 0 | |
| N025/E120 | 0 | |

TOTAL NUMBER OF FAUNAL ITEMS BY SIZE AND TYPE

Surface Test Units

| 1m x 1m Units | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|
| N105/E011 | - | - | 9 | 6 | 6 | - | 25 | 236 | 282 |
| N069/E011 | 1 | 5 | 119 | - | 2 | - | 54 | 11 | 192 |
| N068/W007 | - | 3 | 14 | - | - | - | 6 | 31 | 54 |

NOTE: Small fragments of faunal materials were widely scattered across the site surface. These samples were taken from the three areas of highest density.

TOTAL NUMBER OF FAUNAL ITEMS BY SIZE AND TYPE

Excavation Test Units

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N107/E003 | 3 | - | - | - | - | - | - | 1 | - | 1 |
| | 12 | - | - | 1 | - | - | - | - | - | 1 |
| | 13 | - | - | 2 | - | - | - | 2 | 1 | 5 |
| | 15 | - | - | 1 | - | 1 | - | - | - | 2 |
| | 16 | - | - | - | - | - | - | - | 1 | 1 |
| | 17 | - | - | 1 | - | - | - | - | - | 1 |
| | 18 | - | - | 2* | - | - | - | - | 1 | 3 |
| | 19 | - | - | 1 | - | 1 | - | 1 | - | 3 |
| | 21 | - | 1 | 5 | - | 42 | - | 35 | - | 83 |
| | 22 | - | - | 7 | - | 14 | - | 16 | - | 37 |
| | 23 | - | - | 4 | - | 22 | - | - | - | 26 |
| | 24 | - | - | 1 | - | 36 | - | 8 | - | 45 |
| | 25 | - | - | 6 | - | 44 | - | 9 | - | 59 |
| | 26 | - | - | 10 | 1 | 3 | - | 6 | - | 20 |
| | 27 | - | - | 6 | - | 10 | - | 5 | - | 21 |
| Totals | | 0 | 1 | 47 | 1 | 173 | 0 | 83 | 3 | 308 |

*One of these two bones is intermediate in size between small and medium.

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N106/E003 | 1 | - | - | - | - | - | - | - | 1 | 1 |
| | 2 | - | 1 | 4 | - | - | - | - | - | 5 |
| Totals | | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 1 | 6 |
| N098/E007 | 3 | - | - | - | - | - | - | 1 | - | 1 |
| | 4 | - | - | 1* | - | - | - | - | - | 1 |
| | 7 | - | - | 2 | - | 1 | - | 1 | - | 4 |
| | 8 | - | - | 3 | - | - | - | 1 | - | 4 |
| Totals | | 0 | 0 | 6 | 0 | 1 | 0 | 3 | 0 | 10 |

*This bone is intermediate in size between small and micro.

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N074/E028 | S1 | - | 2 | 17 | - | - | - | - | 14 | 33 |
| | 2 | - | - | 11 | - | - | - | 3 | 2 | 16 |
| | 3 | - | - | 1 | - | - | - | - | - | 1 |
| Totals | | 0 | 2 | 29 | 0 | 0 | 0 | 3 | 16 | 50 |
| N074/W016 | S1 | - | - | - | - | - | - | 3 | 1 | 4 |
| | 6 | - | - | - | - | - | - | - | 2 | 2 |
| | 7 | - | - | - | - | - | - | - | 1 | 1 |
| | 8 | - | - | 1 | - | - | - | - | 4 | 5 |
| | 9 | - | - | 3 | - | - | - | - | 4 | 7 |
| | 10 | - | - | 2 | - | - | - | 2 | 23 | 27 |
| | 11 | - | 1 | 4 | - | 1 | - | - | 18 | 24 |

TOTAL NUMBER OF FAUNAL ITEMS BY SIZE AND TYPE

Excavation Test Units

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N074/W016 | 12 | - | - | 4 | - | - | - | - | 7 | 11 |
| | 13 | - | - | 4 | - | - | - | 2 | 4 | 10 |
| | 14 | - | - | 2* | 1 | - | - | - | - | 3 |
| | 15 | - | - | 1 | - | - | - | 1 | 2 | 4 |
| | 16 | - | - | 2 | - | - | - | - | 1 | 3 |
| Totals | | 0 | 1 | 23 | 1 | 1 | 0 | 8 | 67 | 101 |

*One of these two bones is intermediate in size between small and micro.

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N067/W010 | S1 | - | - | 7 | - | 4 | - | 12 | 7 | 30 |
| | 2 | - | - | 1 | - | - | - | 1 | 2 | 4 |
| | 3 | - | - | - | - | - | - | - | 3 | 3 |
| Totals | | 0 | 0 | 8 | 0 | 4 | 0 | 13 | 12 | 37 |
| N067/W011 | S1 | - | - | 3 | 1 | - | - | 1 | 17 | 22 |
| | 2 | - | - | 3 | - | - | - | - | - | 3 |
| | 3 | - | - | - | - | 1 | - | - | - | 1 |
| Totals | | 0 | 0 | 6 | 1 | 1 | 0 | 1 | 17 | 26 |
| N067/W012 | S1 | - | 1 | 4 | 1 | - | - | - | 3 | 9 |
| | 3 | - | - | - | - | - | - | 2 | - | 2 |
| Totals | | 0 | 1 | 4 | 1 | 0 | 0 | 2 | 3 | 11 |
| N067/W013 | S1 | - | - | 2 | - | - | - | - | 5 | 7 |
| | 2 | - | 1 | - | - | - | - | - | 3 | 4 |
| | 5 | - | - | 5 | - | - | - | - | - | 5 |
| Totals | | 0 | 1 | 7 | 0 | 0 | 0 | 0 | 8 | 16 |
| N067/W014 | S1 | - | - | 8 | - | 1 | - | - | 43 | 52 |
| | 2 | - | - | 1 | - | - | - | - | - | 1 |
| | 4 | - | - | 2 | - | - | - | - | - | 2 |
| Totals | | 0 | 0 | 11 | 0 | 1 | 0 | 0 | 43 | 55 |
| N067/W015 | 4 | - | - | 3 | - | - | - | - | - | 3 |
| | 5 | - | - | - | - | - | - | - | 1 | 1 |
| | 6 | - | - | 2 | - | - | - | 1 | 1 | 4 |
| | 7 | - | - | 4 | - | - | 1 | - | 16 | 21 |
| | 8 | - | 1 | 9 | - | - | - | 6 | 205 | 221 |
| | 9 | - | - | 9 | - | 1 | - | 1 | 10 | 21 |
| | 10 | - | - | 5 | - | - | - | - | 1 | 6 |
| Totals | | 0 | 1 | 32 | 0 | 1 | 1 | 8 | 234 | 277 |

TOTAL NUMBER OF FAUNAL ITEMS BY SIZE AND TYPE

Excavation Test Units

| 1m x 1m Units | Level | Large | Medium | Small | Micro | Fish | Bird | UD Other | Mussel Shell Valves | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| N067/E011 | S1 | - | 3 | 3 | - | - | - | 1 | 1 | 8 |
| | 2 | - | - | 2 | - | - | - | 4 | 2 | 8 |
| | 3 | - | - | 2 | - | 2 | - | 1 | - | 5 |
| | 4 | - | - | - | - | 1 | - | - | - | 1 |
| | 5 | - | - | - | - | - | - | 1 | - | 1 |
| | 6 | - | - | 3 | - | - | - | - | - | 3 |
| | 7 | - | - | 3 | - | - | - | - | - | 3 |
| Totals | | 0 | 3 | 13 | 0 | 3 | 0 | 7 | 3 | 29 |
| N056/E111 (Posthole) | All | - | - | - | - | - | - | - | - | 0 |
| Totals | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N054/W011 | S1 | - | - | - | - | - | - | - | 1 | 1 |
| | 2 | - | - | 2 | 1 | - | - | 1 | - | 4 |
| | 3 | - | - | - | - | - | - | 1 | - | 1 |
| | 5 | - | - | - | 1 | - | - | - | - | 1 |
| | 7 | - | - | - | 1 | - | - | - | - | 1 |
| | 8 | - | - | - | - | - | - | 1 | - | 1 |
| Totals | | 0 | 0 | 2 | 3 | 0 | 0 | 3 | 1 | 9 |
| N033/E002 | All | - | - | - | - | - | - | - | - | - |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N025/E120 (Posthole) | 2 | - | - | - | - | - | - | 4 | - | 4 |
| Totals | | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 |

APPENDIX A-2

SUMMARY DATA TABLES

Third Canyon Site (45BN188)

LITHIC DEBITAGE, CORES, AND FIRE-CRACKED ROCK

| Test Unit | Primary | Secondary | Interior | Shatter | Blades | Cores | FCR | Total |
|---|---|---|---|---|---|---|---|---|
| Combined Surface Collection | 8 | 4 | 1 | 1 | 1 | 4 | 1 | 20 |
| Subsurface | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 8 | 4 | 1 | 1 | 1 | 4 | 1 | 20 |

LITHIC RAW MATERIALS

| Test Area | Andesite | Basalt | Chert | Jasper | Obsidian | Opal | Quartz | Totals |
|---|---|---|---|---|---|---|---|---|
| Surface | 4 | 20 | 5 | 0 | 1 | 1 | 1 | 32 |

FAUNA

| Test Area | Large | Medium | Small | Micro | Fish | Bird | UD/Other | Shell | Total |
|---|---|---|---|---|---|---|---|---|---|
| Surface | Surface Collection not taken--no high density areas observed. | | | | | | | | |
| Subsurface | 0 | 11 | 8 | 5 | 0 | 0 | 32 | 0 | 56 |

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# APPENDIX B

## SOIL DESCRIPTIONS

by

Kim Simmons

Soil descriptions are given for each test unit excavated. They are shown for each change in soil within the test unit. Post holes in the floor of most test units continued the strata and are presented in the following soil descriptions as well. The information for the post holes is sketchier than for the excavated units and is usually noted to be the same as the strata above.

## SOIL DESCRIPTIONS

### Box Canyon Site (35UM64)

033N/002E 0-44 cm; medium sand, 10YR 3/3, massive, loose, nonplastic.

44 cm; rodent activity, some cultural material.

44-90 cm; fine sand with some volcanic ash mixed in, 10YR 4/3, massive, very friable, nonplastic.

90-145 cm; same as above.

145 cm; basalt talus.

054N/011W 0-32 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--lag.

32-100 cm; fine sand, 10YR 4.5/3, massive, loose, nonplastic, cultural material present--rodent activity.

100-148 cm; same as above.

148 cm; volcanic ash.

148-170 cm; sand.

170 cm; river gravels.

067/010W 0-42 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--lag.

42-74 cm; fine sand, 10YR 5/3, massive, very friable, nonplastic.

74-150 cm; same as above.

150 cm; river gravels.

067/011W 0-52 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material persent--lag.

067N/012W 0-68 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--lag.

167N/013W 0-85 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--lag.

067N/014W

0-24 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, abundant medium vertical roots.

24-48 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, very few fine roots.

48-56 cm; medium sand with high mussel shell concentration, 10YR 4/3, massive, loose, nonplastic, cultural material present--in situ, shell and carbon.

56-118 cm; medium sand, 10YR 4/3, massive, loose, nonplastic.

067N/015W

0-40 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, plentiful very fine roots and few medium to coarse vertical roots, cultural material present--lag.

40-130 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, few coarse horizontal disintegrating roots, cultural material present--lag.

130-140 cm; medium sand with high mussel shell concentration, 10YR 4/3, massive, loose, nonplastic, cultural material present--in situ, shell and carbon.

140-161 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--rodent activity.

067N/011E

0-70 cm; fine sand, 10YR 4/3, massive, very friable, nonplastic, cultural material present--including carbon stains, possibly in situ.

70 cm; basalt talus, river gravels and very coarse basalt sand.

074N/028E

0-90 cm; fine sand, 10YR 4/3, massive, very friable, nonplastic, cultural material present--rodent activity.

90-130 cm; same as above.

130 cm; basalt talus.

074N/016W

0-61 cm; coarse sand, 10YR 3.5/2 (basalt)--10YR 5/3 (nonbasalt), moderate to strong; thick platy; very friable, nonplastic, cultural material present.

61-95 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present.

95-105 cm; medium sand with high mussel shell concentration, 10YR 4/3, massive, loose, nonplastic, cultural material present--in situ, shell with bone and flakes.

074N/016W (cont.) 105-158 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--possibly in situ since no rodent activity.

098N/007E 0-27 cm; medium sand, 10YR 3/3, massive, loose, nonplastic, rodent activity, cultural material present--lag.

27-47 cm; coarse sand, 10YR 4/3, massive, loose, nonplastic, cultural material present--rodent activity.

47-62 cm; fine sand, 10YR 4/3, massive, very friable, nonplastic, cultural material present--rodent activity.

62-107 cm; fine sand, 10YR 4/3, massive, loose, nonplastic.

107-189 cm; same as above.

189 cm; basalt talus.

107N/003E 0-40 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, few medium to coarse, and plentiful fine vertical roots.

40-129 cm; coarse sand, 10YR 4/3, moderate medium platy, very friable, nonplastic.

129-140 cm; medium sand, 10YR 4/3, massive, loose, nonplastic.

140-160 cm; medium sand with basalt sand and organic material, 10YR 4/3, massive, loose, nonplastic, cultural material present.

160-186 cm; volcanic ash, 10YR 7/2, massive, firm, plastic, intense rodent activity.

186-312 cm; medium sand, 10YR 4/3, massive, loose, nonplastic, rodent activity, cultural material present--in situ, carbon stains included and not associated with rodent activity.

312 cm; basalt talus and some river gravel.

Test Postholes on East Slope of Site

017N/092E 0-15 cm; sand and organic material.

15 cm; volcanic ash.

15-58 cm; medium grain sand, rodent activity.

48-90 cm; fine sand.

90 cm; basalt bedrock.

025N/120E 0-61 cm; fine sand, historically disturbed.

61 cm; basalt bedrock.

056N/111E 0-38 cm; medium sand.

38-75 cm; medium sand with basalt fragments.

75 cm; basalt bedrock.

017S/010E 0-22 cm; volcanic ash, 10YR 5.5/3, massive, very firm, plastic, intense rodent activity.

22-37 cm; volcanic ash, 10YR 7/2, massive, very firm, plastic, intense rodent activity.

37-43 cm; volcanic ash, 5YR 6/3, massive, very firm, plastic, intense rodent activity.

43-70 cm; medium-grain sand, 10YR 4.5/3, massive, loose, nonplastic.

70-160 cm; sand, possibly same as above.

160 cm; basalt talus.

033S/004W 0-53 cm; sandy to silty loam, 10YR 4.5/3, massive, friable, plastic, few medium horizontal disintegrating roots, cultural lag from surface.

53-110 cm; same as above.

110 cm; basalt talus.

040S/030E 0-70 cm; coarse sand, 10YR 4/2, thick moderate platy, loose, nonplastic.

70-141 cm; sand, possibly same as above.

141 cm; basalt talus.

040S/054E 0-22 cm; medium sand, 10YR 4.5/3, very thick, weak platy, loose, nonplastic, few fine roots.

22-36 cm; coarse sands, 10YR 4/2, thick, moderate platy, loose, nonplastic.

36-84 cm; medium sand with volcanic ash mixed, 10YR 5.5/3, and dark horizontal stains, 10YR 4/2, massive, loose, nonplastic, rodent activity.

| | |
|---|---|
| 040S/054E (cont.) | 84-93 cm; volcanic ash, 10YR 6/2, massive, firm, plastic, intense rodent activity. |
| | 93-160 cm; medium sand, 10YR 4.5/3, massive, loose, non-plastic, rodent activity. |
| | 160-270 cm; sand, possibly same as above. |
| 094S/002E | 0-5 cm; medium sand, 10YR 4.5/3, massive, loose, nonplastic, rodent activity. |
| | 5-52 cm; coarse sand, 10YR 4/2 - 10YR 6/3, thick, moderate, platy; loose, nonplastic, rodent activity refilled with medium sand and volcanic ash. |
| | 52-83 cm; coarse sand, 10YR 4.5/2, massive, loose, nonplastic. |
| | 83-172 cm; sand, possibly same as above. |
| 150S/030W | 0-32 cm; medium grain sand, 10YR 4.5/3, massive, loose, non-plastic, intense rodent activity filled in with ash or ash and sand mix. |
| | 32-78 cm; volcanic ash, 10YR 6.5/2, moderate medium platy, firm, plastic, rodent activity. |
| | 78-107 cm; volcanic ash, 7.5YR 5.5/4, massive?, very firm, plastic. |
| | 107-131 cm; volcanic ash, 10YR 7.5/2, massive, very firm, plastic. |
| | 131-157 cm; fine grain sand, 10YR 4.5/3, massive, very friable, nonplastic. |
| | 157 cm; basalt talus. |
| 232S/042W | 0-56 cm; coarse sand, 10YR 4/2, moderate thick platy, loose, nonplastic. |
| | 56-70 cm; medium sand, 10YR 4.5/3, massive, loose, nonplastic. |
| | 70-72 cm; coarse sand, 10YR 4/2, massive, loose, nonplastic. |
| | 72-96 cm; medium sand, 10YR 4.5/3, massive, loose, nonplastic. |
| | 96-157 cm; sand, possibly same as above. |
| 244S/107W | 0-17 cm; medium sand with large angular basalt talus, 10YR 4.5/3, massive, loose, nonplastic. |

290S/027W 0-42 cm; coarse sand, 10YR 4/2, moderate thick platy, loose, nonplastic.

42-117 cm; sand, possibly same as above.

# APPENDIX C

## PETROGRAPHIC ANALYSIS OF TEPHRAS FROM ARCHAEOLOGICAL SITES 35UM64 AND 45BN188

by

Bruce D. Cochran

### Purpose

Since tephras (volcanic ashes) are used as time marker horizons for correlating cultural and geologic events in the Pacific Northwest, positive identification and determination of source (vent) of primary tephras found in the sedimentary record is necessary. Several methods employed for ash identification and characterization include petrographic and elemental composition analysis (by the electron-probe microanalyzer, x-ray diffraction and fluorescence, neutron activation, etc.). The latter method is both expensive and time consuming. Furthermore, elemental characterization is only necessary when petrographic techniques fail to positively identify the tephra.

Petrographic identification of volcanic ash beds that are interbedded with aeolian sands at sites 45BN188 and 35UM64 was conducted to determine: (1) the associated mineral suite, (2) refractive index of volcanic glass separates, and (3) shard (glass) morphologies. These characteristics, combined with stratigraphic and geomorphic relationships, provide clues concerning the origin of the ash.

### Procedures

Samples of volcanic ash were cleaned and separated into five particle sizes (0.149, 0.125, 0.105, 0.088, and 0.074 mm) ranging from fine sand to very fine sand. Grain mounts of size fractions below 0.125 mm were prepared for petrographic analysis on a Leitz research petrographic microscope.

Refractive index of glass separates, glass morphologies, and associated minerals were determined on all samples. To expedite separation of primary and secondary, "contaminated" tephras, the binocular stereographic microscope was used. (Contaminants are particles which are exotic to volcanic ashes; such as, well-rounded quartz and basaltic grains, rounded biotite and muscovite mica flakes, and lithic fragments.)

Point counts of the 0.105 mm fraction of five samples was done to determine percentages of glass, phenocrysts, and contaminating debris. Detailed petrographic examination of the remaining samples was conducted to determine differences and similarities between all samples.

## Results

Seven tephra samples from the following excavation units at sites 35UM64 and 45BN188 were collected for characterization by petrographic examination.

| Sample Number | Site | Excavation Unit |
|---|---|---|
| 108RS4 | 35UM64 | 107N/003E |
| 115RS4 | 45BN188 | 150S/030W |
| 114RS3 | 45BN188 | 150S/030W |
| 111RS2 | 45BN188 | 150S/030W |
| 112RS3 | 45BN188 | 017S/010E |
| 113RS2 | 45BN188 | 017S/010E |
| 110RS1 | 45BN188 | 017S/010E |

Stratigraphic positions of the samples (refer to Figures IV-1, 4, and 5 in text) indicate that 108RS4, 115RS4, and 112RS3 are primary ash deposits. Five samples (see Table C-1) were examined thoroughly.

Sample 108RS4 is white (10YR 7/2, dry) and varies in thickness from 27 to 42 cm across the exposed section. The deposit has been disturbed by moderate bioturbation which complicates collection of an *in situ* sample.

Petrographic examination revealed a phenocryst suite that is associated with the Mazama ashfall 6,700 years ago. Orthopyroxene (hypersthene), clinopyroxene (probably augite), and green and brown hornblende are auhedral and have volcanic glass attached. Nearly all plagioclase grains are auhedral and angular and lack attached glass.

Three main types of glass, distinguished during petrographic examination, include: vesicular (pumice), tubular, and platy (with and without ribbing). Vesicular glass dominates the 0.105 mm size fraction (69 percent of total) and has a refractive index of 1.508. Refractive indices for the tubular glass varied consistently between 1.507 and 1.508. The platy glass has faint birefringent edges suggesting a slight compositional variation from the other glass types. Refractive indices of this glass ranged between 1.505 and 1.506.

Sample 115RS4 is pinkish white (7.5YR 3/2, dry) and is about 23 cm thick. Massive sedimentary structures and little bioturbation indicates primary depositional conditions. Again, orthopyroxene, clinopyroxene,

TABLE C-1

POINT COUNT ANALYSIS OF FIVE TEPHRA SAMPLES

| Sample Number | Minerals | | | | | | | | | | Glass | | | | | Total % Glass | Total % Phenos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Orthopyroxene (hypersthene) | Clinopyroxene (augite) | Plagioclase | Hornblende | Magnetite | Biotite* | Muscovite* | Quartz* | Lithics | Unknowns** | Vesicular | Tubular | Platy | Devitrified | Brown Tubular | | |
| 108RS4 | 2 | 7 | 2 | tr | tr | - | - | - | - | - | 69 | 6 | 10 | 3 | tr | 88+ | 11+ |
| 115RS4 | 2 | 16 | 4 | 3 | 1 | tr | - | - | 3 | - | 41 | 12 | 14 | 3 | - | 70 | 29+ |
| 114RS3 | 2 | 14 | 10 | 3 | 1 | tr | - | tr | 7 | - | 43 | 3 | 12 | 3 | tr | 61 | 37+ |
| 112RS3 | 8 | 1 | 4 | 2 | tr | tr | tr | tr | 7 | tr | 57 | 7 | 10 | 2 | - | 76 | 22+ |
| 110RS1 | 1 | 5 | 3 | 1 | tr | 6 | tr | tr | 3 | tr | 62 | 8 | 10 | tr | - | 80 | 19+ |

NOTE: Three samples were thought to be primary and two secondary before petrographic examination. Percentages (number in column) are based on 500 to 1,000 grain counts of 0.105 mm size fraction.

*Biotite, muscovite, and quartz do not have attached glass.

**Fragments too small (microtites) for identification.

green and brown hornblende, plagioclase, and magnetite are the only minerals in this ash. Occurrence of biotite and lithic grains probably represents contamination by faulty sampling or by bioturbation. Lithic fragments, however, have been found in primary ashes.

Three glass types include vesicular (pumice), tubular, and platy with refractive indices of 1.508, 1.507, and 1.505 to 1.506 respectively. Birefringent edges are common to the platy glass.

Twenty-nine centimeters of pink (10YR 7/4, dry) volcanic ash (Sample 114RS3) overlies the deposit from which 115RS4 was collected. This unit has been moderately disturbed by bioturbation.

Stereo microscopic inspection revealed the following contaminants: well-rounded quartz, biotite, and basaltic grains. Petrographically, the unit contains orthopyroxene, clinopyroxene, green and brown hornblende, plagioclase, magnetite minerals and vesicular (pumice), tubular, and platy volcanic glass. Refractive indices of 1.508 was determined on the vesicular and tubular glass. Birefringent edges were noted on the platy glass which had a refractive index of 1.507.

Thickness of the ash deposit from which sample 111RS2 was extracted varies between 28 and 48 cm across the exposed section. This ash deposit is light gray (10YR 6/2, dry) and contains large krotovinas. The deposit directly overlies the ash bed from which sample 114RS3 was collected (Figure IV-5).

Grains were not counted because the sample contained abundant contaminants (biotite, quartz, and lithic grains). Petrographic examination indicates that the glass separates and associated minerals are identical to the other samples. Refractive indices of vesicular (pumice), tubular, and platy glass is 1.503, 1.508, and 1.506 to 1.507, respectively.

Sample 112RS3 is pink (5YR 8/3, dry) and was collected from a basal ash bed that is 5 to 6 cm thick across the exposed section (see Figure IV-4) at site 45BN188. Petrographically, the ash contains orthopyroxene, clinopyroxene, plagioclase, green and brown hornblende, biotite, muscovite, magnetite, lithic grains and vesicular, tubular, and platy volcanic glass. The ash appeared to be primary but biotite, muscovite, and lithic contaminants indicate the ash was redeposited. Refractive index of 1.508 was determined for the vesicular and tubular glass; whereas, the refractive index of platy glass varied between 1.505 and 1.506.

The ash bed from which sample 113RS2 was collected overlies sample 112RS3 and varies in thickness from 14 to 16 cm across the exposure. Extreme rodent burrowing has modified and introduced contaminants into the ash deposit. The ash contains orthopyroxene, clinopyroxene, green and brown hornblende, plagioclase, magnetite, biotite, and mucovite. The latter two minerals are contaminants and their presence suggest reworking and redeposition of the ash. Glass morphologies include vesicular, tubular, and platy type with refractive indices of 1.508, 1.507, to 1.508, and 1.505 to 1.506 for each type respectively.

Sample 110RS1 was collected from an ash bed that directly overlies the bed from which sample 113RS2 was extracted. The sample is very pale brown (10YR 8/3, dry) and has abundant large krotovinas.

Even though the sample is not a primary volcanic ash deposit, petrographic analysis was done for comparative purposes. The sample contains orthopyroxene, clinopyroxene, green and brown hornblende, plagioclase, biotite, muscovite, quartz, sanidine (with attached volcanic glass), zircon, magnetite, and lithic grains. Morphologically, three types of glass are found in the unit. These include vesicular/pumice, tubular, and platy glass with a refractive index of 1.508, 1.507, and 1.505 to 1.506 respectively. The abundance of edge-rounded biotite, well-rounded quartz, and lithic fragments indicate the ash was redeposited.

## Conclusions

Petrographic analysis of tephra beds at sites 35UM64 and 45BN188 revealed the following:

(1) The ash is composed of three distinctive shard (morphological) types, which are vesicular (pumice), tubular, and platy.

(2) Each glass type has a different refractive index (vesicular 1.508, tubular 1.507-1.508, platy 1.504-1.507).

(3) Associated minerals (with glass attached) consist of orthopyroxene (hypersthene), clinopyroxene (probably augite), green and brown hornblende, and magnetite.

(4) Glass types and associated minerals are identical to those found in deposits of Mazama ash.

(5) Samples 108RS4 and 114RS4 are primary tephra deposits and samples 114RS3, 111RS2, 112RS3, 113RS2, and 110RS1 are examples of secondary redeposited ashes.

Petrographic characteristics combined with stratigraphic position and thickness clearly indicates the tephras at sites 35UM64 and 45BN188 identical ash ejected from Mount Mazama 6,700 years ago.

# APPENDIX D

## FIELD DESCRIPTION OF THE TWO RIVERS SITE (45BN14)

The Two Rivers Site was initially included in those to be investigated by the present project. After the project's field reconnaissance, it was excluded from further, more detailed study. This allowed more complete consideration of the Side Canyon Sites as a more unified analytical group. Though not tested by the present project, the Two Rivers Site remains a potentially significant cultural property. In this appendix, I have summarized the descriptive data from the field reconnaissance. While limited by the brevity of the investigation, this information nonetheless extends data offered by Cleveland et al. (1976:26-27) from the earlier river survey. I hope that it may assist in planning future management and research options for the site.

The Two Rivers Site is located on the southwestern bank of the Columbia River, immediately south of the confluence of the Columbia and Snake Rivers. It is presently part of the Two Rivers County Park. The site's location and park status make it subject to erosion from water action and to the impact of frequent recreation use. Nonetheless, extant cultural materials indicate a need for continued or heightened protective measures.

At present, the site appears to parallel the Columbia for a distance of at least 370 meters. Cultural materials are evident in both the river bank gravels and in eroded bank cuts. No surface depressions or features are evident. Observed materials consist of profuse fire-cracked rock, scattered cobble bifaces, and large basalt and relatively coarse grained silicious river stones. Flakes are common. Among these, cryptocrystalline flakes are present but less frequently observed. This may reflect preferential collection of these materials by relic hunters and/or the burial of small flakes under river sands.

Judging from topographic maps, the prehistoric shoreline would have been 10 to 20 meters east of the present shoreline illustrated on Figure D-1. A large portion of the site undoubtedly is now underwater. Despite inundation, a considerable extent of the site remains parallel to the river. Though subject to further confirmation, it is likely that cultural materials are limited to a narrow band along the present shoreline. Vertically, cultural materials appear to be confined to a silt/sand stratum approximately one meter thick. This stratum lies between overlying of coarse sand and bedded sandy silt, and underlying river cobbles (c.f., Cleveland et al. 1976:26). If these river cobbles originally downbedded toward the river, then we may now be seeing the outer periphery of the site. Projecting from experience of the Umatilla Site (35UM1), cultural depth may increase toward the prehistoric shoreline. If so, much of the site's cultural remains are now gone. However, this remains speculative in the absence of more complete site testing.

The extent of the site implies a sedentary village complex. Superficially it appears not unlike other village sites on the Columbia and

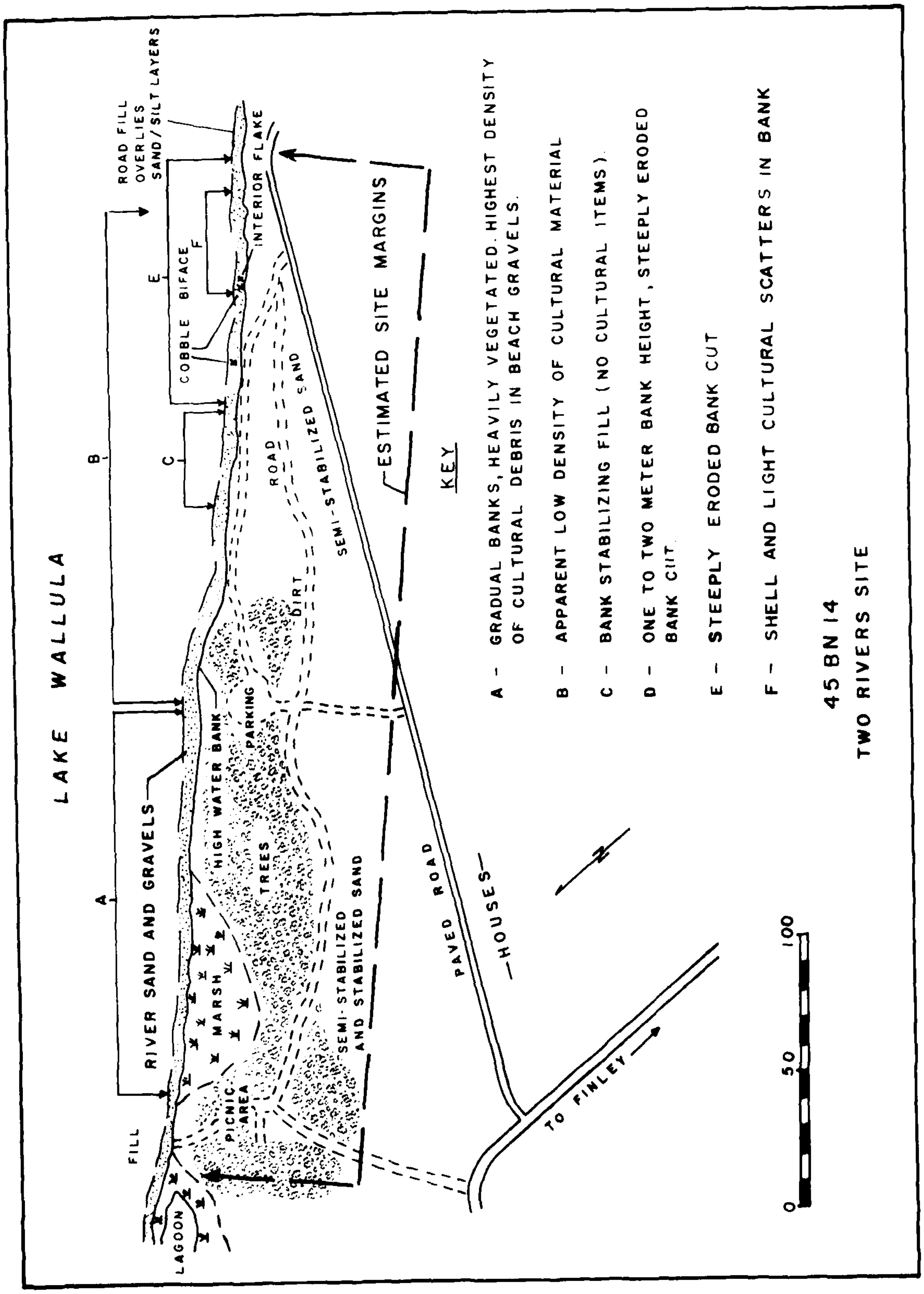
LAKE WALLULA
RIVER SAND AND GRAVELS
ROAD FILL OVERLIES SAND / SILT LAYERS
COBBLE BIFACE
INTERIOR FLAKE
FILL
LAGOON
PICNIC AREA
MARSH
HIGH WATER BANK
TREES
PARKING
DIRT ROAD
SEMI-STABILIZED SAND
SEMI-STABILIZED AND STABILIZED SAND
ESTIMATED SITE MARGINS
PAVED ROAD
HOUSES
TO FINLEY
N
KEY
A – GRADUAL BANKS, HEAVILY VEGETATED. HIGHEST DENSITY OF CULTURAL DEBRIS IN BEACH GRAVELS.
B – APPARENT LOW DENSITY OF CULTURAL MATERIAL
C – BANK STABILIZING FILL (NO CULTURAL ITEMS).
D – ONE TO TWO METER BANK HEIGHT, STEEPLY ERODED BANK CUT
E – STEEPLY ERODED BANK CUT
F – SHELL AND LIGHT CULTURAL SCATTERS IN BANK
0
50
100
45 BN 14
TWO RIVERS SITE

Fig. D-1.

Snake Rivers. Its inundation, however, has made it less attractive to some archaeologists and to relic collectors than other, more intact sites in the area. I suggest that the site be sampled to determine more adequately its physical and cultural characteristics. In the meantime, efforts should be made to protect the site from continuing bank erosion and, if possible, from relic collecting.

The extant portions of the site are illustrated on the field map (see Figure D-1). Please note that the dimensions are approximate.

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