AN ABSTRACT OF THE THESIS OF

Daniel M. Mulligan for the degree of Master of Arts in Interdisciplinary Studies in Anthropology, Anthropology, and Geography presented on April 21, 1997.

Title:

Crescent Lake: Archaeological Journeys into Central Oregon's Cascade Range

Abstract approved: David R. Brauner

David R. Brauner

The rugged Cascade Range of central Oregon has been long regarded as an enigmatic, archaeological puzzle in the study of the Pacific Northwest's ancient past. While ethnographic and archaeological research in the adjacent northern Great Basin, Columbia Plateau and Willamette Valley have revealed a rich and ancient tapestry of Native American peoples, cultures, histories and lifestyles, little is known about the human past of the intervening mountainous area. Factors such as scattered and/or small-scale investigations, limited research funding, complex terrain, variable environmental conditions and a poor historical record have tended to compel the archaeological community to shy away from casting an in-depth, contemplative eye on the central Oregon Cascades.

However, recent research at Crescent Lake and other high elevation lake areas have produced evidence that suggests native peoples made seasonal use of the central Oregon uplands for at least the past 8,000 years. Analysis of cultural material recovered at the Crescent Lake Site (35KL749) suggests small, mobile groups repeatedly made seasonal journeys to Crescent Lake during both pre-Mazama (eg., pre-7000 B.P.) and post-Mazama (eg., post-6800 B.P.) times. Numerous artifacts found buried between late Pleistocene glacial till and recent surface soils suggest that Crescent Lake may have been a popular upland destination throughout the Holocene.

Crescent Lake:
Archaeological Journeys into Central Oregon's Cascade Range

by

Daniel M. Mulligan

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Arts in Interdisciplinary Studies

Completed April 21, 1997

Commencement June 15, 1997

Master of Arts in Interdisciplinary Studies thesis of Daniel M. Mulligan
presented on April 21, 1997

APPROVED:

Major Professor, representing Anthropology

Professor, representing Anthropology

Professor, representing Geography

Chair of Department of Anthropology

Dean of Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Daniel M. Mulligan, Author

printed copy of this thesis a reality. These three have taken impending crisis management to a new level. A mighty thanks and a "Whewwww!" to you all.

To my family, who have always provided me with unyielding support, encouragement, occasional butt kicks and a "safe" place to center myself while working on this project. Thank you for reminding me what's really important in life.

I would especially like to thank my parents, Bill and Marcella Mulligan. They are two *very* special people and have always been my heros and source of inspiration. Thank you for always being there for me and for being such wonderful role models. I love you very much.

Lastly, hail to all the native people who left their archaeological legacy at Crescent Lake. I hope I got it right.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

LIST OF PLATES

Plate

We labor in vain to evoke our past, but all our intellectual efforts will always prove futile. The past is hidden somewhere beyond the reach of our minds, somewhere in the sensation of some material object that we would not expect. And only chance determines whether or not we come upon the that object before we die.

--- *Marcel Proust,*
Remembrance of Things Past

Crescent Lake:
Archaeological Journeys into Central Oregon's Cascade Range

Chapter 1: INTRODUCTION

One of the least understood aspects of Pacific Northwest archaeology centers on the nature of prehistoric Native American use and adaptation to high elevation lake environments. The vast majority of archaeological investigations near upland lakeshores have been limited to small-scale surface surveys, project-specific subsurface testing and monitoring operations conducted in advance of timber sales and other federal resource management undertakings. In nearly every case, functional, chronological and technical data necessary for the reconstruction of viable subsistence-settlement patterns in these areas have not been produced. Such is the case for the high lakes of the central Oregon Cascades.

Despite the fact that recent archaeological research in the Cascades of northern Oregon and Washington has attempted to piece together a broader picture of prehistoric settlement and subsistence in the uplands, only a few projects have focused on the mountainous areas of central Oregon. Likewise, little emphasis has been placed on the role played by upland lake sites. Investigations at Crescent Lake and other mountain lakes in central Oregon have revealed a wealth of archaeological material that suggests mobile peoples repeatedly reoccupied these areas for thousands of years. Beyond this, almost nothing is known about who these people were, what they were doing and how long they were there.

In an effort to gain a better understanding of how and why prehistoric groups used central Oregon's high lakes, this project will focus on the archaeological data recovered at the Crescent Lake Site (35KL749) on the northern shore of Crescent Lake. Analyses of the artifact assemblage will be made in a bid to shed light on the land use patterns and activities practiced by the lake's visitors. An attempt will also be made to relate those findings to material and patterns seen at other locations around Crescent Lake. The results of this study will then be compared with data from other high lake sites in the central Oregon Cascades. Thus, the ultimate goal of this project is to provide answers to the following fundamental research questions:

1. *What was the nature and extent of human use of Crescent Lake's north shore area during prehistoric times?*

   (a) *What type(s) of subsistence/economic activities took place there?*

   (b) *Can patterns of land use be determined within the site?*

   (c) *Can a temporal chronology be established from the existing data base?*

   (d) *Can cultural affiliation be inferred from the existing data base?*

2. *What was the influence of the Mount Mazama eruptions on use patterns at Crescent Lake?*

   (a) *Does the artifact assemblage reflect changes in subsistence/economic activities? What are the changes, if any?*

   (b) *Can the intensity of occupations prior to and after the eruptions be inferred from the density of cultural material?*

   (c) *Did land use patterns within the site change after the eruptions?*

3. *Does cultural material found in other areas around Crescent Lake reflect similar exploitation patterns?*

4. *How do the subsistence/economic and land use patterns revealed at Crescent Lake relate or compare to archaeological findings at other high lake sites in the central Oregon Cascades?*

5. *Do the occupation patterns revealed at Crescent Lake fit with contemporary models of prehistoric human use and settlement in the central Oregon Cascades?*

6. *Can the archaeological significance of 35KL749 be evaluated in terms of its eligibility for inclusion on the National Register of Historic Places?*

Despite the large amount of cultural material found at 35KL749, several important limitations must be noted. The Crescent Lake archaeological data base is primarily represented by artifacts recovered during excavations near the lake's northern shore. As is often the case on federal lands, the locations of many subsurface test units were dictated by proposed Forest Service development projects, rather than to fulfill purely research-oriented objectives. Thus, many of the test locations appear to be randomly scattered across the site area; this unsystematic arrangement, coupled with only minimal stratigraphic information taken primarily from the test unit profiles, means that little or no distinction can be made between individual occupation levels (other than between pre- and post-Mazama period components).

Furthermore, questions about whether 35KL749 is truly a *single*, large site or a cluster of numerous smaller, closely-spaced or overlapping sites or habitation areas could not be answered given the way the area has been investigated. As a consequence, definitive horizontal and vertical boundaries have not been determined for the site. However, the large quantity of recovered cultural material does suggest that a range of functions and activities did occur at the Crescent Lake Site through time. The archaeology of other locations around the lake, however, is little known and primarily restricted to surface material found in disturbed contexts.

Most investigations at other high lakes in the central Oregon Cascades have also been very limited in scope and offer only a limited data base for comparison purposes. Likewise, the numbers and types of technical analyses that could be performed at Crescent Lake were restricted by limited time, personnel and funding. Therefore, the conclusions presented here must be considered as both preliminary and a reflection of the need for more extensive archaeological research at Crescent Lake and other upland lake areas of central Oregon.

Every effort has been made to make this research project as thorough as possible. Consequently, some of the material included in the background and overview chapters may at first appear to be extraneous given the scope of most theses. In the absence of specific information concerning the life of peoples who lived in the central Oregon Cascades, significant sociocultural developments and trends from the better-known, adjacent cultural regions are presented within the context of possible influences on the occupation of the Cascades. Much of this information has been drawn together from the work of other researchers in the Cascades, northern Great Basin, Columbia Plateau and Klamath Basin in an effort to build a broad sociocultural/environmental framework from which the prehistory of the central Oregon Cascades may be better understood. Hopefully, this information will be useful to and revised by future investigations in the mountainous areas of central Oregon.

Chapter 2: ENVIRONMENTAL SETTING

Location

Crescent Lake is a 4,547-acre (1,840-hectare) natural lake located in a broad, glacially-scoured valley on the eastern flank of the central Oregon Cascade Range (Fig. 1). Situated at an elevation of 4,839 feet (1,475 meters) above mean sea level in the southwestern corner of the Deschutes National Forest (Fig. 2), the lake can be easily accessed from the towns of Oakridge (29 miles to the northwest) and Crescent (approximately 18 miles to the east). Crescent Lake is one of central Oregon's major recreational areas, home to four U.S. Forest Service campgrounds and picnic areas, over 70 recreation cabins, a Boy Scout camp and a private resort. In spite of the area's many recreational opportunities, much of the lake's shoreline remains undeveloped.

35KL749 is located along the northern shore of Crescent Lake in T. 24 S., R. 6 E., Section 11, Klamath County, Oregon (Fig. 3, 4). The 14-acre lithic scatter rests on a terminal moraine and extends eastward from Crescent Lake Campground to the grounds of Crescent Lake Lodge Resort. Cultural material has also been found northward along the banks of Crescent Creek. Moreover, a number of smaller sites and isolated artifacts have been documented in various locations around the entire periphery of the lake.

Physical Geography and Geology

Crescent Lake is situated on the upper east flank of central Oregon's Cascade Range (Fig. 5). Stretching in a north-south direction between southern British Columbia and northern California, the Cascades actually consist of two parallel mountain chains. On the west lie the much older Western Cascades, a relatively low chain that began development about 42 million years ago (Orr et al. 1992:142-145). At least four episodes of volcanism and plutonic uplift have reshaped and deformed

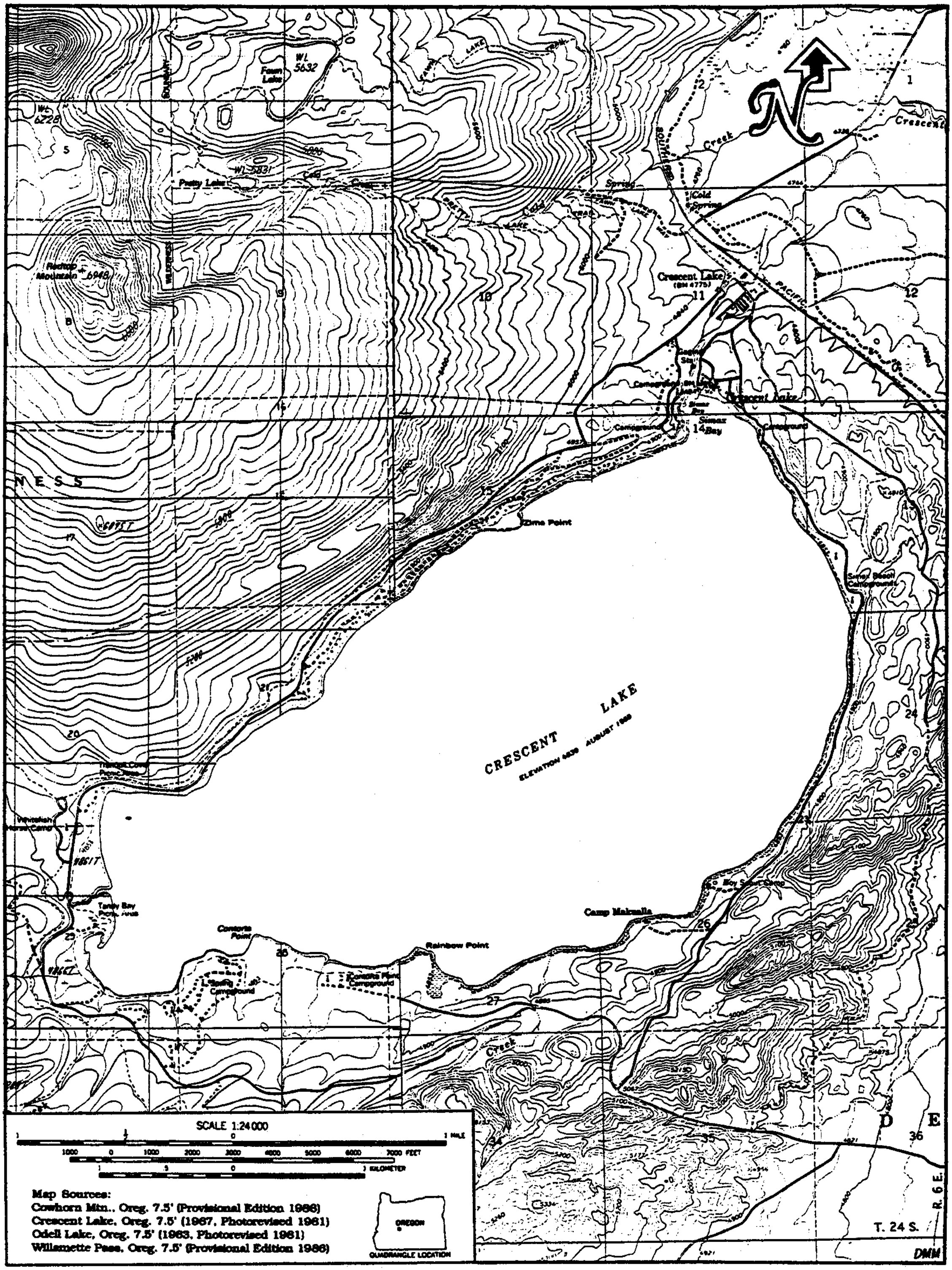

Fig. 1. Crescent Lake, Oregon.

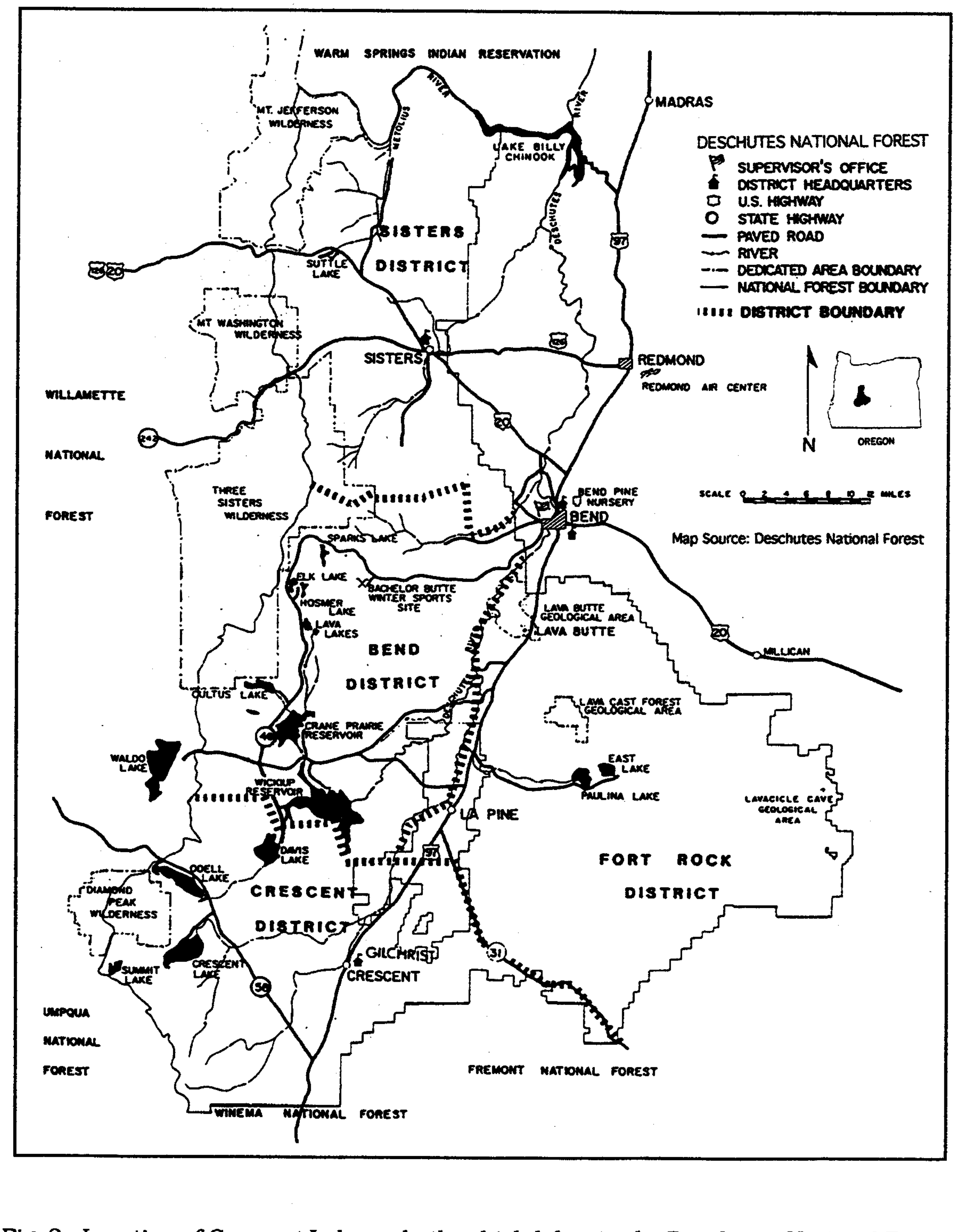

Fig. 2. Location of Crescent Lake and other high lakes in the Deschutes National Forest.

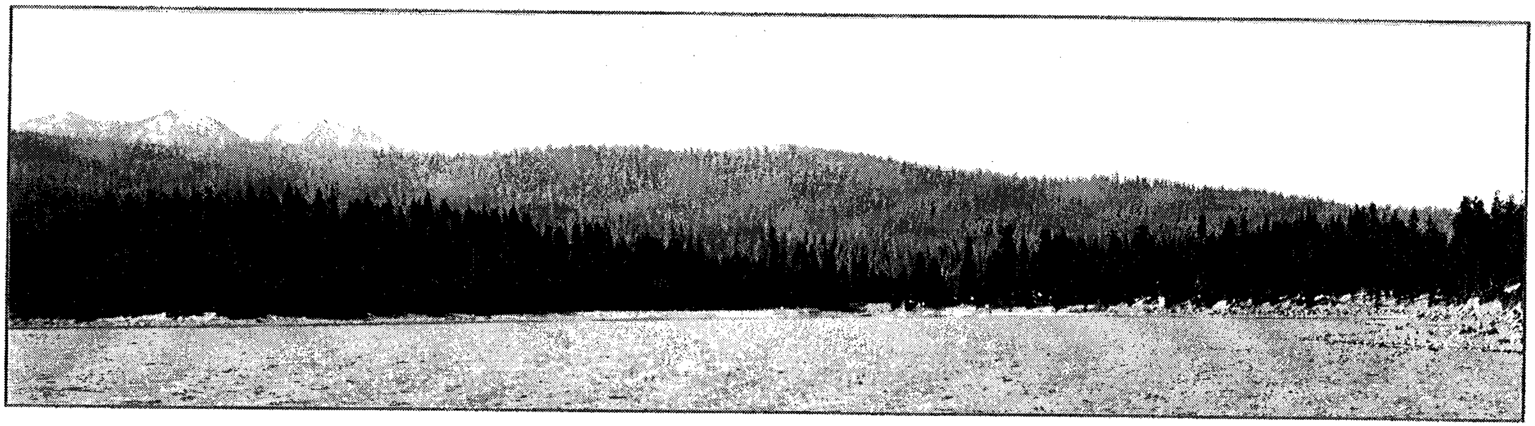

Fig. 3. View of 35KL749, Crescent Lake Site, facing northwest.

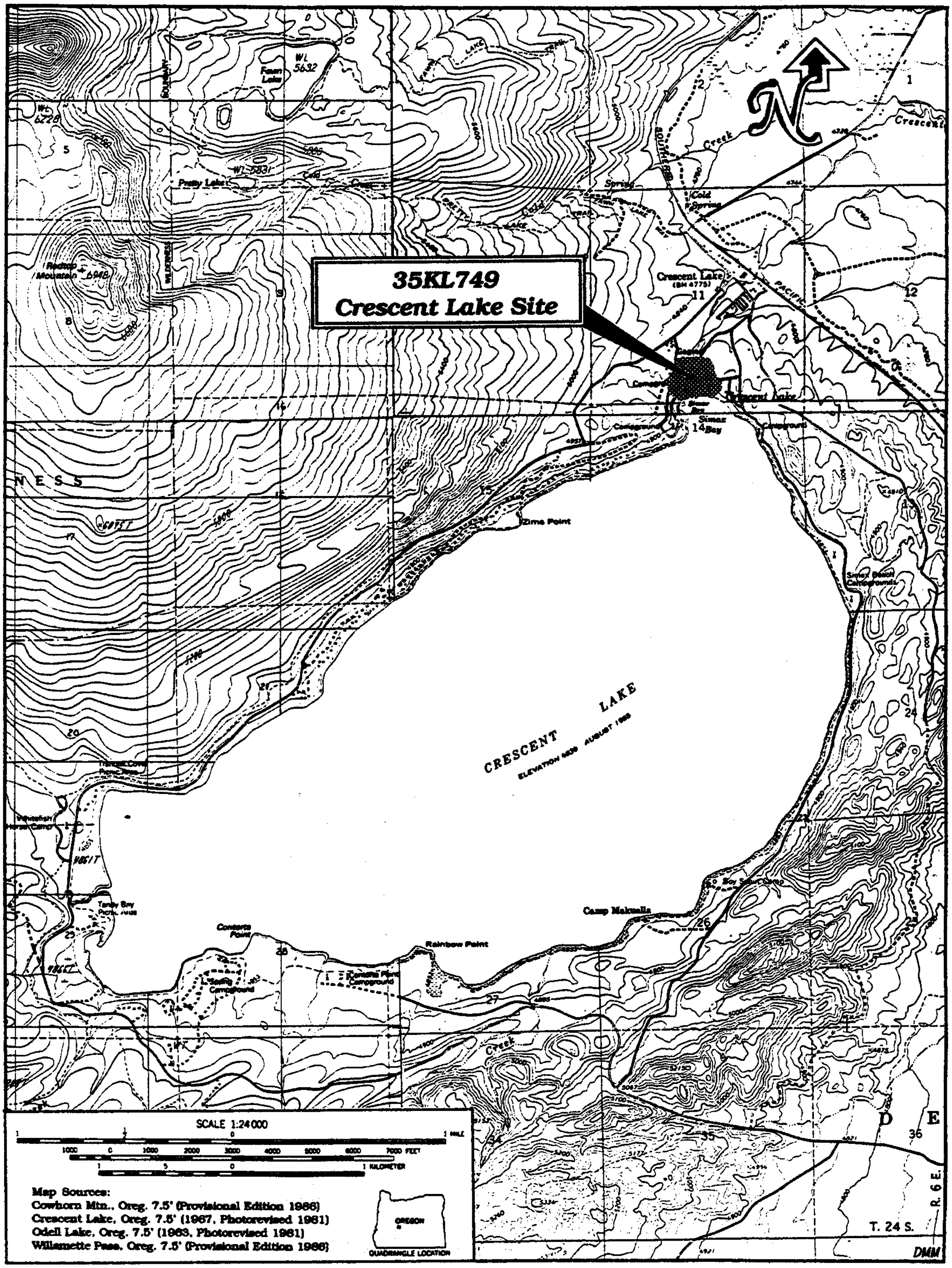

Fig. 4. Location of 35KL749 at Crescent Lake.

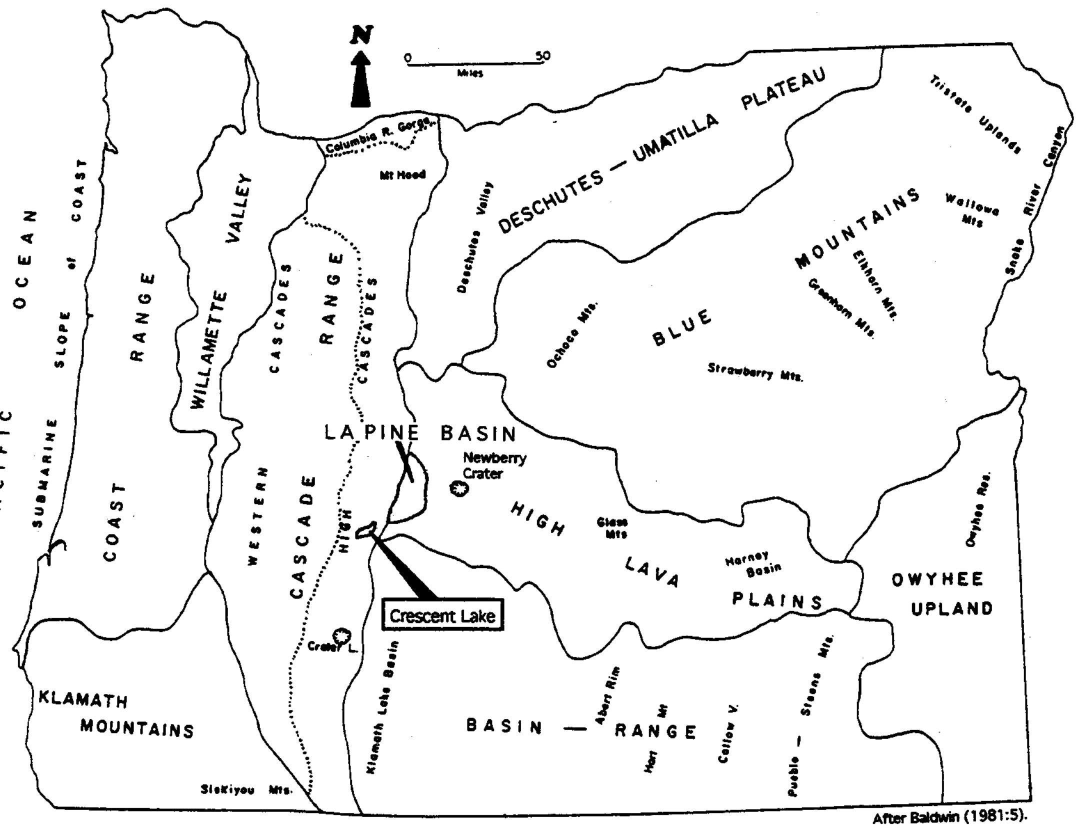

Fig. 5. Physiographic provinces near Crescent Lake.

Western Cascades, giving it a sloping, ramp-like appearance in sharp contrast to the craggy pinnacles to the east. Elevations range from 1,700 feet on the western margin to 5,800 feet in the east. Storms moving inland from the Pacific Ocean have repeatedly battered and carved the western slope since the mid-Miocene. This ongoing process has left the landscape wrinkled with extensive ridgelines and erosional valleys.

East of the Western Cascades rises the High Cascades Physiographic Province (Orr et al. 1992:141-166). This alpine region extends from the spine of the jagged volcanic ridge tops down to the more-gently sloping, lower mountain flanks. The lower margins descending eastward into the central Oregon high plateau are surrounded by numerous lava fields, cinder cones and strato volcanoes. Extensive sand and gravel sheets are also found in these lower elevations, indicating that glacial meltwater has been actively eroding and ferrying rock material down from the uplands.

The High Cascades are geologically young, dating almost exclusively to the late Miocene, Pliocene and Pleistocene epochs (Baldwin 1981:71; Franklin and Dyrness 1988:25; Harris 1988:35-36). Although some lava flows are only a few hundred years old, the most extensive depositions date to the late Pliocene and Pleistocene. Many of the high mountains forming the modern Cascade crest began emerging approximately 4.5 to 2 million years ago. The earliest stages of Cascade volcanism were punctuated by the emergence of broad, overlapping shield volcanoes, small cinder cones and basalt flows. Later, more diverse rhyolites, andesites and basalts began to appear. Over time, the rugged volcanic platform continued to transform and eventually became dominated by the familiar, tall composite cones of the modern High Cascades.

Pleistocene glaciation has also made a significant contribution to the High Cascades' complex geologic complexion. Glacial ice has extensively carved the volcanic pile during the last 100,000 years, resulting in a panorama of eroded volcanic remnants, cirques, ridges, kettle lakes, scoured valleys and great blankets of boulders and gravels (Larsen 1976:284). Telltale signs of glacial deformation abound in Crescent Lake's alpine neighborhood and are especially prominent on nearby peaks such as Diamond Peak (8,744 feet), Emigrant Butte (6,464 feet), Cowhorn Mountain (7,664 feet) and Redtop Mountain (6,948 feet). Crescent Lake, itself, was forged and shaped by the massive erosional and depositional power of late Pleistocene ice movement. Similarly, the same forces that created the lake basin approximately 14,000-12,000 years ago also left a record of retreat in the form of a large, gentle to moderately-steep terminal moraine along the lake's northern shore (Crandell 1965).

Another physiographic province in the immediate vicinity of Crescent Lake is the LaPine Basin (Larsen 1976:284). Crescent Lake's outlet, Crescent Creek, flows northeastward into the province's nearly-flat landscape. The basin countryside is characterized by broad, shallow flood plains that have been swept smooth by the meandering action of the Deschutes River, Little Deschutes River and smaller tributaries. The ground surface has been extensively-filled and reworked by alluvial, lacustrine and pumice deposits, with up to 10 feet of Mount Mazama tephra shrouding the province's southern extent. Elevations in the LaPine Basin range from 4,200 to 4,500 feet above sea level, although local topographic relief seldom exceeds 25 feet.

East of the LaPine Basin are the High Lava Plains (Baldwin 1981:131). This vast plateau extends from the eastern flanks of the Cascades near the Deschutes River to the eastern edge of the Harney Basin in southeastern Oregon. Volcanic activity during the Pliocene, Pleistocene and early Holocene left the region covered with extensive lava and obsidian flows, lava buttes, cinder cones, lava tubes, caverns and caves. The province's relatively-flat surface blanket of air-fall pumice and ash is pimpled by numerous dacite mounds, rhyolite domes and cinder cones that rise to between 4,700 and 5,200 feet above sea level. Only a few intermittent drainages and springs exist in this generally waterless environment. The landscape is dominated by the 500-square-mile Newberry Volcano, home to Paulina and East Lakes, numerous lava tubes, flows, obsidian sources, caves and other young landforms.

Hydrology

As previously mentioned, Crescent Lake occupies a single deep basin carved by glacial ice during the late Pleistocene. The lake is five miles long, four miles wide and has a maximum depth of 265 feet (80.8 meters) (Johnson et al. 1985:58). The Crescent Lake drainage basin covers a densely-forested area of 57 square miles (140 square kilometers). The primary surface inflow enters the lake's southwest corner from Summit Lake via Summit Creek and lesser amounts are contributed by Mountain Creek, Whitefish Creek and Rainbow Creek. Several small, intermittent streams also add a small quantity of runoff during the snowmelt season. The basin's outlet, Crescent Creek, drains the lake from its northern tip where it is restricted by a terminal moraine before descending down a moderate slope toward the Little Deschutes River.

Water from Crescent Lake plays a key role in the irrigation of some 8,000 acres of land on the west side of the Deschutes River near Bend. After being reserved for irrigation purposes in 1909, the lake's outlet was harnessed in 1922 by a privately-sponsored, small cribbed, earthfill dam. The Bureau of Reclamation's Crescent Lake Dam Project took control in the mid-1950s and replaced the original dam with a 40-foot high spillway in 1955-56. This reconstruction raised the natural lake level by approximately 28 feet (8.5 meters), causing innundation and erosion of the original shoreline and terraces. Additional improvements were also made to the drainage canal and lateral system paralleling Crescent Creek between 1974-77. The project is now operated and maintained by the Tumalo Irrigation District (Johnson et al. 1985:58).

Crescent Lake's water level commonly fluctuates from year-to-year due to late summer irrigation withdrawls and/or diminished spring runoff brought on by regional droughts. Annual irrigation drawdowns often lead to a drop of as much as several feet. Reoccurring drought cycles (such as seen during the summer of 1992) have also caused the water surface to temporarily plunge to near prehistoric levels. This hydrologic waxing and waning action has resulted in soil mixing, stripping and redeposition of cultural material all along the present shoreline.

Soils

The soils of Crescent Lake are quite similar to those present throughout the High Cascades region (Larsen 1976:10-12). Generally, most are immature and display little morphological development, due in large part to the relatively young geologic age of the parent materials. Dacite pumice lapilli and other volcanic ejecta from the Mount Mazama eruptions of 7,000-6,800 years ago form the most extensive soil material. Soils derived from these materials are generally poorly-developed and are classified as *Vitrandepts* (or Regosols). Soil sequences are typically represented by "a thin, dark-colored A1 horizon of sandy loam or loamy sand texture (that) is underlain by a transitional AC horizon which grades into the unaltered coarse sand or gravelly sand parent material" (Franklin and Dyrness 1988:26)

Below the volcanic mantle lie older, previously-developed soils. These buried soils are derived from Pleistocene-age hard basalts, andesites, tuffs, breccias, glacial till and outwash material. Soils of this type are generally classified as *Cryorthods*, *Haplorthods* or *Cryumbrepts*.

> The Cryorthods (Podzels) are deep and well drained with gray, stony or gravelly sandy loam surface horizons underlain by reddish-brown, stony or gravelly loam subsoils. Haplorthods (Brown Podzolic soils) are similar but show less development of a gray A2 horizon. Typical soil textures are a gravelly loam surface over a very stony loam subsoil. Cryumbrepts (Regosols) tend to be much shallower to bedrock (1 meter or less) and are generally very stony sandy loam in texture (Franklin and Dyrness 1988:26).

Larsen (1976:12) provides a more-generalized description of soil morphology common to Crescent Lake and most areas encompassed by the Deschutes National Forest:

> In horizon (soil layer) description terminology, a typical sequence above the buried soil is A1, AC, and C. At the upper elevations, where mountain hemlock occurs, a thin A2 horizon is commonly present. B horizons are practically nonexistent on the course-textured volcanic soils. The A1 horizons are typically very thin under Forest vegetation, with the AC and C horizons making up the major portion of the profile. On the course-textured pumice soils, there is typically a C1 and C2 horizon sequence, the C2 commonly being more sandy than the C1 material above.

For a detailed description of soils and stratigraphy encountered at 35KL749, see Chapter 7.

Landtypes

In order to more-fully comprehend the complexity and diversity of the Crescent Lake environment, it is important to delineate distinct, definable land systems that can be found around the lake's perimeter. Distinct landtypes are defined according to specific sets of geomorphic, soil, drainage, climate and vegetation characteristics. A landtype classification chart has been prepared for Crescent Lake (Table 1) based on Larsen's (1976:15-16) Deschutes National Forest landtype classification scheme. Landtypes can also be represented graphically as individual mapping units, whereby the dominant landtype accounts for at least 70 percent of the mapping unit (Fig. 6). In cases where two or more landtypes form a complex arrangement in which none predominates, the area has been designated as a complex mapping unit. For this project, only the landtypes within an arbitrary 1.5-mile boundary of the lakeshore have been presented.

Table 1. Crescent Lake Landtype Classification.

Mapping Unit No.	Dominant Landtype No.	Dominant Landform(s)	% Slope Range	% Slope Mean	Slope Aspect	Broad Forest Type/Vegetation	Elev. (Feet)	Parent Materials	Depth to Buried Soil (Inches)	Depth to Bedrock (Inches)	Bedrock Type	Drainage Class	Infiltration Class	Remarks/Representative Area(s) near Crescent Lake
2B	2B	Gently sloping glacial uplands and broad glacial valley floors.	0-80	10	Varies	Lodgepole pine, lupine, needlegrass, pinemat manzanita. Typically sparse ground cover. Some true firs, mountain hemlock may be present.	5000-6000'	Pumice lapilli and pumiceous volcanic ash over buried soils on glacial till.	36-88"	N/A	N/A	Excessively drained.	Rapid	Southern to northwest margin of lake.
5	5	Wet depressions and meadows, nonforested forested bottomlands.	0-10	3	Varies	Nonforest wet meadows.	3300-6800'	Alluvium and organic materials.	N/A	N/A	N/A	Poorly to moderately well drained.	Variable	Southeast (Big Marsh Creek)
8	8	Stream bottomlands, terraces/gentle sideslopes along drainages.	0-30	10	Varies	Mixed conifers (White fir, Engelmann spruce, lodgepole pine, aspen, Douglas fir, some ponderosa pine). Variety of shrubs, sedges, grasses and forbs present.	2200-5300'	Alluvium and outwash.	N/A	N/A	N/A	Poorly to moderately well drained.	Variable/ Limited by watertable.	West (Whitefish Creek inlet and Tranquil Cove)
9G	9G	Gentle to moderately steep, complex slopes on glacial moraines.	0-30	15	Varies	Mixed conifers (Douglas fir, Shasta red fir, ponderosa pine, lodgepole pine, white fir). Snowbrush, chinquapin, sedges, manzanita, a few grasses and forbs are present.	4600-5300'	Pumice lapilli and volcanic ash over sandy to loamy buried soils on glacial till.	36-65"	N/A	N/A	Excessively to well drained.	Rapid	North
9J	9J	Steep side slopes of glacial moraines.	30-60	40	North	Mixed conifers (Douglas fire, Shasta red fir, ponderosa pine, white fir, white pine, lodgepole pine). Chinquapin and snowbrush also present.	4600-5400'	Pumice lapilli and volcanic ash over sandy to loamy buried soils on glacial till.	36-55"	N/A	N/A	Excessively to well drained.	Rapid	Northwest
9M	9M	Gentle to moderately steep upland lava plains and till plains.	0-30	15	Varies	Mixed conifers (Ponderosa pine, white fir, Douglas fir, sugar pine, Shasta red fir, white pine, lodgepole pine). Chinquapin, snowbrush and manzanita are common.	4500-6000'	Pumice gravel and volcanic ash over older soils on glacial till.	60-150"	60+"	Basalt and other volcanics.	Well to excessively drained.	Rapid	Northwest to northern shoreline
9N	9N	Steep slopes along glacial moraines, valley walls or ridges.	30-70	45	North	Mixed conifers (Ponderosa pine, white fir, Douglas fir, Shasta red fir, lodgepole pine, sugar pine, white pine). Chinquapin, snowbrush and manzanita are common.	4500-6000'	Pumice gravel, volcanic ash and glacial till.	60-150"	60+"	Basalt, andesite and other volcanic rocks.	Excessively to well drained.	Rapid	Southeast
20	20	Uneven glaciated uplands with many small lakes.	0-50	20	Varies	Lodgepole pine, Mtn. hemlock, some true firs and Engelmann spruce.	5300-6000'	Volcanic ash, pumice and glacial till.	10-30"	Variable	Variable	Well drained on the uplands.	Rapid to moderate.	North, south
43	43	Gently sloping outwash plains and bottomlands.	0-5	3	Varies	Lodgepole pine, forbs, grasses and sedges.	4200-4600'	Sandy, pumiceous volcanic ash and pumice lapilli; alluvium; and glacial outwash.	20-60"	N/A	N/A	Poorly to somewhat poorly drained.	Slow to moderate/ Limited by watertable.	Northeast, east
44	44	Gently sloping to nearly level outwash plains.	0-5	3	Varies	Lodgepole pine, bitterbrush and forbs. Some squirreltail, Idaho fescue, bearberry may occur.	4200-4600'	Sandy, pumiceous volcanic ash and pumice lapilli over a buried soil on glacial outwash.	20-60"	N/A	N/A	Moderately well drained.	Rapid to moderate.	Northeast
96	96	Gently sloping outwash plains.	0-30	5	Varies	Lodgepole pine, bitterbrush, squirreltail, needlegrass, sedges.	4200-4900'	Pumice lapilli and volcanic ash over buried soils on glacial outwash.	0-80"	N/A	N/A	Excessively drained.	Rapid	Southeast
HG	16, 17	Uneven to gently sloping glaciated uplands, complex slopes, ground moraines, broad benches.	0-40	10-20	Varies	Mtn. hemlock, lodgepole pine, true firs, huckleberry, sedges, woodrush, needlebrush.	4200-6500'	Sandy volcanic ash, pumice or pumice lapilli and loamy soils over buried soils on glacial till.	15-36"	N/A	N/A	Well to excessively drained.	Rapid	North (Fawn Lake)

Table 1 (continued).

Mapping Unit No.	Dominant Landtype No.	Dominant Landform(s)	% Slope Range	% Slope Mean	Slope Aspect	Broad Forest Type/Vegetation	Elev. (Feet)	Parent Materials	Depth to Buried Soil (Inches)	Depth to Bedrock (Inches)	Bedrock Type	Drainage Class	Infiltration Class	Remarks/Representative Area(s) near Crescent Lake
HW	12, 20, 2	Uneven high elevation glacial uplands with pothole lakes, seeps or drainages, complex slopes.	0-70	10-25	Varies	Mtn. hemlock, lodgepole pine, true firs, Engelmann spruce.	4700-7500'	Volcanic ash, pumice, glacial till, alluvium; some residuum and colluvium.	10-30"	Variable	Basalt and andesite, variable.	Generally well to excessively drained.	Rapid to moderate, may be variable.	West
MC	16,12, 20	Smooth to rolling glaciated uplands, complex slopes.	5-70	20-25	Varies	Mtn. hemlock, lodgepole pine, some true firs.	4300-7500'	Sandy volcanic ash, pumice lapilli and loamy soils on glacial till.	10-36"	N/A	N/A	Generally well to excessively drained.	Rapid to moderate, may be variable.	South (Rainbow Creek)
ME	17,16,12	Gently sloping to rolling or uneven glaciated uplands, ground moraines, complex slopes.	0-70	10-25	Varies	Lodgepole pine, Mtn. hemlock, huckleberry, sedges, woodrush, needlegrass.	4200-7500'	Sandy volcanic ash, pumice or pumice lapilli over buried soils on glacial till.	12-36"	N/A	N/A	Well to excessively drained.	Rapid	Northwest, southwest (Tranquil Cove)
MV	85, 16	Gently to moderately steep slopes on lava plains or glaciated uplands.	0-40	15-20	Varies	Mtn. hemlock, true firs, lodgepole pine, huckleberry, sedges, woodrush.	4300-6800'	Sandy volcanic ash, pumice lapilli over sandy to loamy buried soils or glacial till.	18-40"	20-70"	Mixed volcanics (mostly basalt).	Excessively to well drained.	Rapid	Northwest (near Roundtop Mtn.)
PA	2B, 9G, 9Z	Gentle to moderately steep, complex slopes on glacial deposits.	0-70	10-40	Varies	Lodgepole pine to mixed conifers, needlegrass, snowbrush, chinquapin.	4500-6000'	Pumice lapilli, volcanic ash over sandy to loamy buried soils on glacial till.	36-88"	N/A	N/A	Excessively to well drained.	Rapid	North
PD	9J, 2B	Side slopes of glacial moraines to broad glacial valley floors.	0-60	10-40	Varies	Mixed conifers to lodgepole pine, chinquapin, snowbrush, needlegrass, manzanita.	4600-6000'	Pumice lapilli and volcanic ash over buried soils on glacial till.	36-88"	N/A	N/A	Excessively to well drained.	Rapid	Northeast (Crescent Lake Resort) to southeast (Boy Scout Camp)
PN	98, 9Z	Gentle to moderately sloping lava flows, plains or volcanic flanks. flanks.	0-70	15-30	Varies	Mixed conifers (White fir, Douglas fir, ponderosa pine, sugar pine), snowbrush, chinquapin.	4500-6000'	Pumice lapilli and pumiceous volcanic ash over sandy to loamy buried soils.	33-60"	40-100"	Basalt and andesite.	Excessively to well drained.	Rapid	Southeast
W	N/A	Water (lakes, streams)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WC	2, 17	High elevation drainages, draws on glacial uplands.	0-50	10	Varies	Lodgepole pine, Engelmann spruce, Mtn. hemlock, some	4200-7000'	Volcanic ash, pumice, alluvium, glacial till.	N/A	N/A	N/A	Varies/Poorly to excessively drained.	Variable to rapid.	West (Whitefish Creek)
WE	43, 44	Gently sloping outwash plains and bottomlands.	0-5	3	Varies	Lodgepole pine, forbs, grasses, bitterbrush, sedges.	4200-4600'	Sandy, pumiceous volcanic ash and pumice lapilli, alluvium and glacial outwash.	20-60"	N/A	N/A	Varies/Poorly to moderately well drained.	Variable/slow to rapid.	Northeast (north of Crescent Creek)
WF	44, 43, 5	Gently sloping outwash plains, wet meadows, nonforested bottomlands.	0-10	3	Varies	Lodgepole pine to nonforest meadows, sedges, grasses, forbs.	3300-6800'	Sandy, pumiceous volcanic ash, pumice lapilli, alluvium and glacial outwash.	N/A	N/A	N/A	Poorly to moderately well drained.	Variable	Northeast (along Crescent Creek)
WG	43,9G, 2B	Gently sloping outwash plains and glacial valley floors.	0-30	3-10	Varies	Lodgepole pine, forbs, grasses, sedges.	4200-6000'	Sandy, pumiceous volcanic ash and lapilli, glacial outwash.	0-88"	N/A	N/A	Varies/Poorly to excessively drained.	Variable/slow to rapid.	East and south (Contorta Point)
WH	5, 43	Wet meadows, nonforested bottomlands to outwash plains.	0-10	3	Varies	Nonforest to lodgepole pine, sedges, grasses, wetland forbs.	3300-6800'	Alluvium and organic materials, sandy pumiceous volcanic ash and pumice, glacial outwash.	N/A	N/A	N/A	Poorly to moderately well drained.	Slow to moderate/ limited by watertable.	Southeast (west of Big Marsh Creek)

Fig. 6. Crescent Lake Landtype Map.

Volcanism and Stratigraphic Implications

As noted, the cataclysmic eruptions of Mount Mazama had a profound effect on the Crescent Lake environment. Bacon (1983) and Matz (1991) provide thorough discussions of these violent events and offer provocotive insights on the impacts to the natural environment. In brief, air fall deposits from the Llao eruptive phase dated to about 7,015 +/- 45 radiocarbon years ago were showered across the Pacific Northwest as far as northeastern Washington, southeastern Oregon and western Nevada. This explosion was followed by two closely-spaced eruptions that again spewed ash and pumice across much of western North America. Termed the "single vent" and "ring vent" phases of the climactic eruptive event, these two eruptions probably occurred within days of each other approximately 6,845 +/- 50 radiocarbon years ago. Cumulative thicknesses of the Mazama deposits at Crescent Lake vary from 40-60 inches (1.0-1.5 meters) (Larsen 1976:11).

The hydrographic effect of this sudden sediment dump on Crescent Lake has not been determined, although some researchers have speculated that it may have led to a substantial (albeit temporary) increase in the lake's water level (Flenniken and Ozbun 1990:7). However, no archaeological support for this claim has currently been found. Evidence for such a rise would have profound implications for the location of archaeological material and sites along pre- and early post-Mazama shorelines and nearby terraces. Unfortunately, this problem has not been examined and will not be resolved until further geomorphological and geoarchaeological research can be conducted.

Erosion of unconsolidated volcanic soils is another factor that must be considered when examining Crescent Lake's archaeological record (cf., Bourdeau n.d.). Exposed areas and landforms subject to natural processes such as flooding, upheaval, mass movement, bioturbation and windthrow may exhibit variable degrees of mixing and redeposition. In such cases, it is nearly impossible to place archaeological material in a temporal context. However, the volcanic mantle can be viewed as a distinctive stratigraphic marker for relative dating when found in protected and undisturbed contexts. Just as intact sediments overlying a primary Mazama deposit suggest a post-6800 B.P. date, clayey or silty paleosols and glacial soils found beneath the protective volcanic layer can be assumed to have been there for more than 7,000 years.

Climate

Crescent Lake is subject to the "rain shadow" effect of the Cascade Range checking storms as they move inland from the Pacific Ocean. This topographic buffer contributes to the aridity and harshness of the greater central Oregon climate. Average annual precipitation at Crescent Lake ranges from 40-60 inches (102-152 centimeters) (Johnson et al. 1985:58), with variations dependent on the interplay between differing topographic features and microclimatic influences scattered throughout central Oregon's High Cascades region. The effect of this mountainous rain shadow is dramatically illustrated by the fact that some areas immediately east of the Cascade flanks (eg., Wickiup Reservoir, located about 16 miles northeast of Crescent Lake) receive an average of less than 20 inches of precipitation each year (Larsen 1976:292).

The relatively hospitable climate that predominates from spring to fall (in comparison to the more-extreme variations that occur farther east across the LaPine Basin and High Lava Plains) is due largely to the influence of warm weather patterns coming off the Pacific Ocean (Larsen 1976:290). Warm marine air masses moving inland from the west encounter a drying effect when passing over the Coast Range and Cascades, resulting in a modified continental-type climate. However, severe winter weather conditions can occur when occasional cold arctic air masses collide with or displace the westerly marine air systems. During the spring months, it is not uncommon for warm Chinook winds to come up from the south and southwest and cause rapid snowmelt and flooding in the Cascade uplands.

Cold, moist winters and warm, dry summers characterize the winter precipitation regime that prevails over the Crescent Lake area. Approximately 55-65% of the annual precipitation total falls between November and March, primarily as snow. The U.S. Weather Bureau station at Odell Lake (located about 3.5 miles north of Crescent Lake) commonly reports more than 26 feet (nearly 8 meters) of snowfall annually in the high lakes area immediately east of the Cascade crest (Jaehnig 1994:6). Conversely, summer rains supply only 8-12% of the annual precipitation total, most of which is dumped by thunderstorms between June and August. Maximum July temperatures hover around 80° F (27.0° C) and mean minimum January temperatures plummet to between 15-20° F (-9.0 to -7.0° C) (Franklin and Dyrness, 1988:40-41).

Late Quaternary Environmental Change

Climatic change and its effect on the environment is an important factor that must be considered when attempting to understand human adaptations through time. Hunter-gatherer groups closely-tied to the pulse of the land would have undoubtedly felt the impact of climatic fluctuations, especially through the changing distributions of their chosen subsistence plant and animal communities. However, the responses of people living in the central Oregon Cascades during previous periods of climatic transition are still poorly understood. For this reason, it is necessary for this and future archaeological studies in the Cascades to examine changing environmental conditions in order to establish a framework from which possible human-environment relationships can be evaluated.

The pioneering paleoenvironmental research conducted by Antevs (1948, 1955) has revealed that much of the northern hemisphere has undergone a series of broad-scale climatic shifts since the end of the Pleistocene. Results from Antevs' studies in the North American southwest are summarized in a three-part climatic sequence model that attempts to reconstruct broad-scale climatic conditions and changes across the western United States during the past 10,000 years:

Anathermal (ca. 10,000-7500 B.P.)

This period is characterized by the rapid northward recession of Pleistocene glaciers and widespread drying of pluvial lake and riverine environments. Although the regional climate was initially cooler and moister than current conditions, the roughly 2,500-year time span ushered in an increasing trend toward aridity. Increasingly warmer and arid conditions prevailed in comparison to the preceding late Wisconsin glacial period.

Altithermal (ca. 7500-4500 B.P.)

By circa 7500 B.P., the regional climate had become markedly hotter and drier than present. Environmental conditions were characterized by less-effective precipitation and increased aridity, increased wind erosion, nearly complete disappearance of western glaciers and expansion of grassland and desert-like vegetation. The entire ecosystem of western North America had come under the influence of a long term warming and drying trend.

Medithermal (4500 B.P.-present)

The trend toward modern climatic and environmental conditions appears to have developed around 4,500 years ago. As temperatures moderated and precipitation increased toward present levels, water began to return to previously-dessicated areas. In turn, modern plant species began to expand and eventually replaced xerogenic communities. The environmental regime ushered in during this period reflects a major moderation over the previous two periods.

While Antevs' research was focused on the environmental implications of regional climatic change, Hansen's (1946, 1947) paleoecological work at various locations in the Pacific Northwest was the first to demonstrate that variations in biotic communities may be more-related to local climatic instability. Like Antevs' climatic sequence, Hansen derived four distinct climatic periods that span the late Pleistocene and Holocene epochs:

(1) Period I began during the last glacial maximum and persisted until about 15,000 years ago. Climatic conditions were cooler and wetter than present.

(2) Period II extended from the end of the Pleistocene into the early Holocene (approximately 15,000 to 8,000 years ago). The climate was characterized by increasing warmth and dryness, with conditions likely becoming equivalent to present by 10,000 years ago. The general trend of this period corresponds with Antevs' (1948, 1955) Anathermal episode.

(3) Period III persisted from 8,000 to 4,000 years ago, initiating a stage of maximum warmth and aridity. Antevs' (1948, 1955) Altithermal stage is contemporaneous with this time span.

(4) Period IV represents the last 4,000 years when the climate returned to a cooler and moister regime characteristic of modern conditions. This period is equivalent to Antevs' (1948, 1955) Medithermal stage.

Subsequent studies in the Great Basin and Pacific Northwest by Heusser (1966) and Mehringer (1977, 1985, 1986) have revealed a similar tripartite pattern of broad climatic change, notwithstanding minor chronological differences. Furthermore, recent paleoenvironmental investigations focused on various microenvironments in Oregon and Washington have also provided strong evidence for pervasive *local* climatic fluctuations occurring within the broader pattern of change (Barnowsky 1981, 1983, 1985; Fagan 1974; Whitlock 1992). Such data suggest that long-term environmental change and associated faunal-floral responses may be best understood at the local level. Thus, it would be reasonable to suggest that human land use patterns through time may be better understood by focusing on local paleoenvironments and changes therein.

No paleoenvironmental research has been conducted in the Crescent Lake Basin. However, Hansen's (1942a, 1942b, 1946, 1947) pollen analysis of montane peat deposits taken from a sample of bog locations along the east slope of central Oregon's Cascade Range have yielded data on upland postglacial forest succession, climate and chronology that may be considered analogous to general trends believed to have persisted at many of central Oregon's high lake areas. In addition, links have been established between the Mazama ash fall, biotic shifts and short-term climatic changes. In general, Hansen's findings revealed the following trends:

(1) During the early postglacial period, cool and moist climatic conditions initially favorable to western larch (*Larix occidentalis*) expansion began to moderate somewhat and allowed lodgepole pine (*Pinus contorta*) to become predominant.

(2) After a short period, rising temperatures and decreasing moisture caused the predominance of lodgepole pine forests to be superseded by western yellow pine (*Pinus ponderosa*). As the Anathermal climate gave way to Altithermal conditions, western yellow pine forests continued to expand while lodgepole abundances declined.

(3) Prior to the Altithermal maximum, the western yellow pine advancement was interrupted by the Mazama pumice fall of 7,000-6,800 years ago. A rapid resurgence of lodgepole pine immediately followed the eruptions.

(4) For several thousand years after Mazama, the climate began to return to cooler, moister conditions (eg., corresponding to Antevs' Medithermal period). The initial readvancement and predominance of lodgepole was eventually tempered, presumably because increasing moisture and rapid modification of pumiceous soils were leading to conditions more-favorable to other species. Although lodgepole is still the predominant species in many areas, western yellow pine, Douglas fir (*Pseudotsuga menziesii*), Engelmann spruce (*Picea engelmannii*), western hemlock (*Tsuga heterophylla*) and other minor species have also appeared in greater numbers.

Perhaps the most-relevant palynological work in relation to the Crescent Lake paleoenvironment is the pollen study conducted at Odell Lake (Chatters 1994). Of the 32 pollen samples examined, six were found in glacial till stratum on the southeast end of the lake at the Odell Lake Site (35KL231) and 25 came from a moist swale auger core taken at the the Sunset Cove Site (35KL884) on the lake's northeast end. Although samples from 35KL231 turned out to be somewhat problematic, pollen derived from 35KL884 produced good results (Jaehnig 1994:57-58). The stratigraphy of this site was separated into a series of three zones and six subzones based on percentages of identifiable pollen types. The following is a brief description of the findings:

Zone I

Zone Ia (210-190 cm). Predominant floras appear to be of a xerophytic pine forest, probably ponderosa pine, grass, sagebrush and buckthorn. The site appears to have been dry at the time, as indicated by the peat-like character of the sediments and lack of aquatic pollens.

Zone Ib (190-169 cm). A more mesophytic forest appears to be represented here. Increases in fir, possibly cedar, a high proportion of haploxylon pines and corresponding declines in pine, oak, hackberry and Douglas fir pollens suggest the equivalent of a transition from lower subalpine fir to upper grand fir. Bracken fern, Umbeliferae and buckthorn indicate a moist understory. Aquatic pollen such as water lily and pond weed suggest the site had become an open pond by this period. The climatic conditions appear to have been cool and moist, possibly corresponding to between 8,000-10,000 years ago.

Zone Ic (168-135 cm). A ponderosa pine forest probably shrouded the area at this time. Drier conditions are indicated by an increases in pine, oak, hackberry and the absence of Douglas fir pollen. The disappearance of meadow rue, Umbeliferae, bracken fern coupled with the continued presence of Cruciferae also suggest greater aridity. Smartweed had also replaced pond weed, suggesting a drop in the pond's water depth. Whether this is another indicator of drying or infilling by sediments is unknown. These deposits are estimated to date to between 8000-7000 B.P.

Zone II

Zone IIa (133-38 cm). This subzone covers a brief period (probably only a few centuries) immediately prior to and during the Mazama pumice falls. Although flora preservation is poor, the predominance of grass and Cupressaceae pollen and a high frequency of Cruciferae indicate that a rapid habitat change toward juniper woodland was occurring. Archaeological material recovered from this subzone (immediately below the Mazama deposits) have been radiocarbon dated to around 7,500 years ago (Jaehnig 1994:60-61).

Zone IIb (30-18 cm). Grass has become the dominant terrestrial pollen and all major conifer pollens except Cupressaceae show major declines. The appearance of greasewood indicates that conditions have become much drier than present. This profile represents the culmination of the abrupt habitat change seen in the previous subzone and is indicative of a fully established juniper woodland. Although no evidence was found to indicate how long the juniper-dominated habitat persisted, it may have been negatively-affected around 4000 B.P. when a cooler and moister climatic regime pervaded the nearby northern Great Basin (Mehringer 1985).

Zone III

Zone III (15 cm to surface). Vegetation pollen from this zone indicates the appearance of modern forest taxa. Hemlock, haploxylon pines, fir and Douglas fir display prominent increases, while grasses and other nonarboreal species have declined. The forest asemblage represented here is probably characteristic of that which has persisted over the past few centuries.

Unfortunately, no palynological research has been conducted at Crescent Lake. However, until further studies can provide more information, the close proximity and similar environmental context to Odell Lake may allow Chatter's (1994:13) assessment of Odell Lake's environmental transformation throughout the late Quaternary to be used as a tentative, biohistorical proxy for Crescent Lake:

> Palynological analysis of sediment samples from sites 35KL231 and 35KL884 at Odell Lake, Oregon provides evidence of changing habitats during the Holocene. The column sample from 35KL884 provides a more complete sequence. A forest of what was probably ponderosa pine invaded the site soon after the ice melted and was replaced by a subalpine fir or upper grand fir forest as cool moist conditions developed, probably between 10,000 and 8000 B.P. The ponderosa pine forest then returned and remained until just before the eruptions of Mt. Mazama between 7000 and 6850 B.P. Shortly before the eruption, conditions became

> still drier, and a juniper woodland began to replace the forest, becoming fully established soon after the eruptions. The modern pollen rain, which comes from the ecotone between subalpine fir and grand fir forests, resembles that from approximately 8000 to 10,000 B.P.

Vegetation

Present vegetation growth in the Crescent Lake environment is dependent on factors such as temperature, moisture, elevation, precipitation, soil and underlying materials, slope, aspect, landform and drainage characteristics. The complex vegetational patchwork that covers the central Oregon Cascades is the result of the varying influences and elaborate interplay between these and other environmental variables. One method of assessing how Crescent Lake and its surroundings fit in the broader High Cascades environmental community is to stratify it according to its vegetational life zones.

Plant communities in the Crescent Lake area are typical of those found in the Canadian Life Zone (Ingles 1965:33-34; Larsen 1976:296). Plants living in this zone thrive at variable elevations on broad, high mountain flanks. Cold slope communities typically develop at elevations between 3,500 and 6,000 feet and warm slope species prefer locations between 4,500 and 7,000 feet. Dominant vegetation typically include lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), western white pine (*Pinus monticola*), silver fir (*Abies amabilis*), grand fir (*Abies grandis*), Shasta fir (*Abies magnifica*) and mountain hemlock (*Tsuga mertensiana*). Furthermore, variable concentrations and distributions of these and other species may exist from area to area due to the ever-changing influence of climatic, geologic, biologic and other miscellaneous variables.

As previously noted, Crescent Lake's surroundings have undoubtedly progressed through numerous changes throughout the Holocene. Similarly, the sheer enormity of the Crescent Lake basin makes it very difficult to isolate a definitive vegetational community that adequetely characterizes or represents the environmental diversity currently existing there. However, observations made during recent archaeological investigations at various locations around the lake can be pieced together to paint a clearer picture of the present vegetational landscape:

> Wet and steep terrain in this region has contributed to the establishment of a mixed conifer forest dominated by old growth ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), sugar pine (*Pinus lambertiana*), lodgepole pine (*Pinus contorta*) and mountain hemlock (*Tsuga mertensiana*). The characteristic understory of the Crescent Lake region includes snowbrush (*Ceanothus velutinus*), antelope bitterbrush (*Purshia triadentata*), chinquapin (*Castanopsis chrysophylla*), greenleaf manzanita (*Arctostaphylos patula*), pinemat manzanita (*Arctostaphylos navadensis*), western needlegrass (*Stipa occidentalis*), and Ross sedge (*Carex rossii*). A variety of berries, kinnikinnick (*Arctostaphylos uva-ursi*), and other economic plants are also available. Marsh resources in the Tranquil Bay and southern lake shore areas probably varied in availability depending on the lake level" (Flenniken and Ozbun 1990:8-9).

A generalized catalog of Crescent Lake's primary vegetational species is provided in Table 2 (keyed to Fig. 6). The inferred types and characteristics are based on typical plant associations observed on the particular landtypes that have been designated for the entire Deschutes National Forest (Larsen 1976:189-195). Considering that no formal vegetation inventory has been conducted at Crescent Lake, the listed distributions should be viewed as *potential* rather than actual. For purposes of brevity, only the vegetation of landtypes located within an arbitrary 1.5-mile boundary of the lakeshore have been described.

Fauna

The Crescent Lake area is a habitat to a broad spectrum of wildlife. Large animals found in the area include Black-tailed deer (*Odocoileus hemionus columbianus*), mule deer (*Odocoileus hemionus*), Roosevelt and Rocky Mountain elk (*Cervus canadensis roosvelti* and *C.c. nelsoni*), black bear (*Euarctos americanus*), coyote (*Canus latrans*), bobcat (*Lynx rufus*) and mountain lion (*Felis concolor*).

Table 2. Crescent Lake vegetation characteristics by landtype.

Mapping Unit No.	Dominant Landtype No.	Total Vegetation Cover (%)	Overstory Major Species	Cover (%)	Understory Major Species	Cover (%)	Ground Cover Major Species	Cover (%)	Remarks/Representative Area(s) near Crescent Lake
2B	2B	50-75	Lodgepole pine	45-70	Manzanita	0-5	Needlegrass	0-5	Southern to northwest
							Lupine		margin of lake.
							Pinemat manzanita		
							Sedges		
5	5	70-100	N/A	N/A	Willow	0-40	Grasses	20-100	Southeast
					Alder		Sedges		(Big Marsh Creek)
							Forbs		
							Rushes		
							Mosses		
8	8	80-95	Engelmann spruce	60-80	Alder	10-80	Forbs	20-70	West (Whitefish Creek inlet
			Lodgepole pine		Willow		Sedges		and Tranquil Cove)
			White fir		Vine maple		Grasses		
			Ponderosa pine		Pacific yew		Mosses		
			Douglas fir						
9G	9G	70-95	White fir	60-75	Snowbrush	40-60	Sedges	0-5	North
			Ponderosa pine		Chinquapin		Bracken fern		
			Lodgepole pine		Manzanita		Princess pine		
			Douglas fir						
			Shasta fir						
9J	9J	70-95	Douglas fir	60-75	Snowbrush	20-60	Sedges	0-10	Northwest
			Shasta fir		Chinquapin		Needlegrass		
			Lodgepole pine				Forbs		
			Ponderosa pine						
			White pine						
9M	9M	70-95	Ponderosa pine	60-80	Snowbrush	30-60	Needlegrass	0-5	Northwest to northern
			Douglas fir		Chinquapin		Sedges		shoreline
			White fir		Manzanita		Squirreltail		
			Sugar pine						
			Lodgepole pine						
9N	9N	70-95	Douglas fir	60-80	Snowbrush	30-50	Sedges	0-10	Southeast
			White fir		Chinquapin		Needlegrass		
			Ponderosa pine				Princess pine		
			Shasta red fir						
20	20	40-80	Lodgepole pine	40-70	Huckleberry	5-20	Sedges	5-30	North, south
			True firs		Pinemat manzanita		Bearberry		
			Mountain hemlock				Grasses		
			Engelmann spruce				Forbs		
							Mosses		
43	43	80-95	Lodgepole pine	40-80	Bearberry	5-50	Grasses	40-80	Northeast, east
					Blueberry		Sedges		
							Forbs		
							Mosses		
44	44	70-90	Lodgepole pine	60-90	Bitterbrush	10-50	Forbs	5-50	Northeast
					Bearberry		Sedges		
							Needlegrass		
							Idaho fescue		
96	96	60-85	Lodgepole pine	40-80	Bitterbrush	10-40	Needlegrass	1-5	Southeast
							Squirreltail		
							Sedges		
HG	16, 17	40-90	Mountain hemlock	40-80	Huckleberry	5-30	Princess pine	0-30	North (Fawn Lake)
			True firs		Snowbrush		Sedges		
			Lodgepole pine				Pinemat manzanita		
							Blueberry		
							Huckleberry		
							Mosses		
							Needlegrass		
							Lupine		
HW	12, 20, 2	40-95	Mountain hemlock	30-80	Huckleberry	5-40	Grasses	0-80	West
			True firs		Bearbrush		Sedges		
			Lodgepole pine		Snowbrush		Forbs		
			Engelmann spruce		Pinemat manzanita		Mosses		
					Willow		Bearberry		
MC	16,12, 20	40-95	Mountain hemlock	30-80	Huckleberry	5-40	Princess pine	0-30	South (Rainbow Creek)
			True firs		Snowbrush		Sedges		
			Lodgepole pine		Bearberry		Pinemat manzanita		
			Engelmann spruce		Pinemat manzanita		Blueberry		
							Huckleberry		
							Mosses		
							Grasses		
							Forbs		

Table 2 (continued)

Mapping Unit No.	Dominant Landtype No.	Total Vegetation Cover (%)	Overstory Major Species	Cover (%)	Understory Major Species	Cover (%)	Ground Cover Major Species	Cover (%)	Remarks/Representative Area(s) near Crescent Lake
ME	17,16,12	40-95	Lodgepole pine	30-80	Huckleberry	5-40	Sedges	0-30	Northwest,
			True firs		Snowbrush		Needlegrass		southwest (Tranquil Cove)
			Mountain hemlock		Bearberry		Lupine		
			Lodgepole pine				Pinemat manzanita		
							Princess pine		
							Blueberry		
							Huckleberry		
							Mosses		
							Grasses		
							Forbs		
MV	85, 16	60-90	Mountain hemlock	60-80	Huckleberry	0-30	Sedges	2-30	Northwest
			True firs				Woodrush		(near Roundtop Mtn.)
							Pinemat manzanita		
							Mosses		
							Princess pine		
							Blueberry		
							Huckleberry		
PA	2B, 9G, 9Z	50-95	Ponderosa pine	5-75	Manzanita	0-60	Needlegrass	0-10	North
			White fir		Snowbrush		Lupine		
			Lodgepole pine		Chinquapin		Pinemat manzanita		
			Douglas fir				Sedges		
			Shasta fir				Forbs		
PD	9J, 2B	50-95	Douglas fir	45-75	Snowbrush	5-60	Sedges	0-10	Northeast (Crescent Lake
			Shasta fir		Chinquapin		Needlegrass		Resort) to southeast (Boy
			Lodgepole pine		Manzanita		Forbs		Scout Camp)
			Ponderosa pine				Lupine		
			White pine				Pinemat manzanita		
PN	98, 9Z	60-95	White fir	50-85	Snowbrush	20-60	Needlegrass	0-5	Southeast
			Douglas fir		Chinquapin		Sedges		
			Ponderosa pine						
			Sugar pine						
W	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WC	2, 17	40-95	Lodgepole pine	40-80	Willow	5-40	Sedges	0-80	West (Whitefish Creek)
			Engelmann spruce		Huckleberry		Grasses		
			True firs				Forbs		
			Mountain hemlock				Mosses		
							Needlegrass		
							Lupine		
							Pinemat manzanita		
WE	43, 44	70-95	Lodgepole pine	40-90	Bearberry	5-50	Grasses	5-80	Northeast
					Blueberry		Sedges		(north of Crescent Creek)
					Bitterbrush		Forbs		
							Mosses		
							Needlegrass		
							Idaho fescue		
WF	44, 43, 5	70-100	Lodgepole pine	40-90	Bitterbrush	5-50	Forbs	0-80	Northeast
					Bearberry		Sedges		(along Crescent Creek)
					Blueberry		Needlegrass		
							Idaho fescue		
							Grasses		
							Mosses		
							Willow		
							Alder		
WG	43,96, 2B	50-95	Lodgepole pine	40-80	Bitterbrush	0-50	Grasses	0-80	East and south (Contorta
					Bearberry		Sedges		Point)
					Manzanita		Forbs		
							Mosses		
							Needlegrass		
							Squirreltail		
							Lupine		
							Pinemat manzanita		
WH	5, 43	70-100	Lodgepole pine	40-80	Willow	0-50	Grasses	30-80	Southeast
					Alder		Sedges		(west of Big Marsh Creek)
					Bearberry		Forbs		
					Blueberry		Rushes		
							Mosses		

Smaller game such as rabbits (genus *Sylvilagus*), Golden-mantled ground squirrels (*Citellus lateralis*) and various other ground squirrels (genus *Citellus*, *Otospermophilus* and *Callospermophilus*), townsend chipmunks (*Eutamias townsendii townsendii*), chickarees (*Sciurus douglasii cascadensis*) and pine martens (*Martes caurina caurina*) also roam much of the Cascades' east slope. Likewise, numerous bird species including bald eagles (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*) and other raptors, cranes (*Grus canadensis*), sage grouse (*Centrocercus urophasianus*), blue or sooty grouse (*Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*), turkey, band-tailed pigeon (*Columba fasciata*), mourning dove (*Zenaidura macroura*), hairy woodpecker (*Dendrocopos villosus*) and a variety of songbirds have been observed (Bailey 1936; Davis 1983; Ingles 1965).

Crescent Lake and other nearby fresh water sources (eg., Odell Lake, Davis Lake, Wickiup Reservoir, Crescent Creek, Little Deschutes River and numerous feeder streams, tributaries and springs) also harbor a variety of aquatic organisms. Common fish species include kokanee, lake trout (*Salmo trutta lacustris*), cutthroat trout (*Salmo clarki*), rainbow trout (*Salmo gairdneri*), brown trout (*Salmo trutta*), whitefish (*Prosopium williamsoni*) and mackinaw. Shallow waters are frequented by other riverine and lacustrine creatures such as freshwater mussels and crawdads. Along the water's edge, marshy areas offer choice habitats for the great blue heron [*Ardea herodias*], common merganser (*Mergus merganser*) and other waterfowl species (Flenniken and Ozbun 1990:9; Johnson et al. 1985:58).

Chapter 3: PREHISTORIC-ETHNOGRAPHIC SETTING

Crescent Lake and much of the territory straddling the crest of the central Oregon Cascades are located on the margin between the Columbia Plateau and Great Basin culture areas. This rustic terrain's intricate network of peaks, ridgelines, drainages and other natural trailheads would have provided easy access for small bands of people journeying into the highland country during searches for seasonally-abundant plants and animals, spiritual quests or dealings with other groups. Unfortunately, most information about the region's original inhabitants and their use of mountainous environments is based on ethnographic accounts gathered during the early-twentieth century, long after disease and Euroamerican expansion had devastated traditional lifeways and populations.

The often-sketchy historical accounts written by early Euroamerican explorers, fur trappers, missionaries and settlers are equally capricious in their contribution to our understanding of aboriginal life in the Cascades. Rather, these narratives commonly present a somewhat skewed view of indigenous peoples and only offer a very general picture of native societies. Similarly, the scattered nature of archaeological studies in the Cascades has revealed little about the evolution of central Oregon's upland aboriginal cultures.

Although the study of ethnographic human lifeways can provide models for comparison and contrast with data from older archaeological cultures, such an approach is of limited value because of several fundamental problems:

(1) Ethnographic knowledge lacks the time depth to concretely explain archaeological culture patterns, behaviors, adaptations and material manifestations (i.e. earlier lifeways may have differed significantly and qualitatively from those of later cultures);

(2) Reconstruction of prehistoric cultures based on ethnographic frameworks would be artificial and restrictive (i.e. concern for the understanding of adaptive

patterns and their underlying causes means that archaeological interpretations must view culture as an adaptive system in order to avoid such reconstructions); and

(3) Ethnographic information concerned with early-19th century peoples is extremely limited, incomplete and focuses mainly on cultures occupying The Dalles and lower Deschutes River areas (Lebow et al. 1990:51).

Given the paucity of the data base, the prehistory of the central Oregon Cascades can be best discussed in the context of its possible relationship to those of the adjacent, better-known archaeological cultures of the northern Great Basin, Columbia Plateau and Klamath Basin. The following discussion integrates the findings of recent studies from those areas as well as other high lakes and upland sites in the Cascades in an effort to piece together a clearer image of life in the mountains during ancient times. Archaeological models of subsistence, technology and settlement are described in terms of five cultural periods that are frequently used to define regionally-analogous prehistoric temporal boundaries (Gilsen 1989:3; Lebow et al. 1990:51): Paleoindian Period (12,000-10,500 B.P.); Early Archaic Period (10,500-7000 B.P.); Middle Archaic Period (7000-2000 B.P.); Late Archaic Period (2000 B.P.-Contact); and Contact Period (early-1800s). An overview of ethnographically-known cultural groups who may have exploited the Crescent Lake area is also presented. The subsequent arrival of Euroamerican explorers and emigrants in central Oregon and their influence on the region's aboriginal groups is discussed as well.

Prehistoric Overview

Paleoindian Period

The Paleoindian Period corresponds with the earliest known occupation of the Pacific Northwest. Generally fit into the time period between 12,000 and 10,500 B.P., this cultural stage may also reflect some of the earliest evidence for peopling of North America. Although investigations in Oregon have been fragmentary, models of Paleoindian adaptations in the Columbia Plateau and northern Great Basin regions have been developed:

> This stage is characterized by chipped stone artifacts, particularly large projectile points. The prevalence of these projectile points suggests an emphasis on the hunting of big game, including megafauna which subsequently became extinct. Evidence of Paleo-Indian occupation often occurs in environmental contexts suggesting that climatic conditions were considerably different from those of the present (Minor et al. 1987:20-21).

With its climate still being influenced by the rapidly declining Pleistocene glaciers to the north (eg., prior to the abrupt warming and drying of the Anathermal climatic stage), much of the Great Basin landscape to the east of the Cascades had blossomed into a lush paradise: Numerous lakes were fed to overflowing by fish-filled streams; green riparian vegetation lined the banks of the abundant waterways; herds of Pleistocene megafauna (e.g., mammoth, bison, horse and camel) roamed the fertile marshlands and steppe; and present desert areas were blanketed by woodlands. Small bands of hunter-gatherers are believed to have forged a comfortable living throughout the region by taking full advantage of the abundant wildlife resources found living in the region's many diverse environments. Paleoindian peoples may have maintained a "high technology forager" lifeway, whereby a "high residential mobility hunting strategy and technology" would have allowed groups to follow and successfully exploit known types of animal herds in both familiar and unfamiliar territory (Kelly and Todd 1988:239).

The lack and/or previous looting of documented sites containing perishable artifacts has meant that lithic remains have become the focus of Paleoindian technology studies. Projectile point styles in particular stand out as hallmarks of the Paleoindian period, variations of which are often lumped into either the fluted point tradition or Western Stemmed point tradition (Aikens 1993:20-27). Although numerous lithics typologies have been suggested for both the Columbia Plateau (eg., Leonhardy and Rice 1970; Dumond and Minor 1983) and Great Basin (eg., Heizer and Hester 1978; Thomas 1981), the fluted and Western Stemmed traditions are generally considered the simplest means of classifying the Northwest's earliest known prehistoric technologies across large areas.

Clovis and Folsom points are the key markers of Paleoindian fluted lithic technology. Clovis assemblages appear to have been widespread across the western United States between11,500 and 10,600 B.P. (Haynes 1980). In the Columbia Plateau, a Clovis cache at the East Wenatchee Site has been dated to approximately 11,250 B.P. (Mehringer 1988; Mehringer and Foit 1990). Although neither point type has been recorded along the east slope of the Oregon Cascades, several isolated specimens have been found in the Western Cascades and adjacent Willamette Valley (Bonnichsen et al. 1993). Sixty-one diagnostic Clovis points and associated material have also been found east of the Cascades in southeastern Oregon at the Dietz Site on the shoreline of pluvial Lake Alkali (Fagan 1988; Willig 1984).

Some debate still exists over whether fluted weapons were used by spear thrusting, atlatl throwing or a combination of both (Frison1978, 1989). A similar controversy has also raged over when the transition between fluted point and Western Stemmed traditions occurred. Minor et al. (1987:21) places the shift around 10,000 B.P., coincident with the end of the cool Pleistocene climatic regime and subseqent decline of Ice Age megafauna populations. This date, however, must be viewed as approximate and somewhat flexible, especially since some stemmed point assemblages have been dated to 10,800 B.P. or older (Brauner 1985:90-91; Willig and Aikens 1988:Table 3).

Other investigators argue that apparent temporal overlap and morphological similarities (eg., basal and edge grinding on the haft portion) between fluted points and some Western Stemmed varieties point to a shared cultural lineage (Rice 1972; Sargeant 1973):

> Evidence from other Great Basin sites suggests that the Clovis culture probably gave rise to the later Western Stemmed pattern, although some controversy remains on the point. Fagan (1988) believes that two different groups of people are represented, the Clovis folk being more narrowly focused on a hunting lifeway than were the Western Stemmed folk. Willig (1988) on the other hand stresses continuity between the Clovis and Western Stemmed cultures, believing that together they represent sequent stages of a developing broad-spectrum hunting-gathering "Paleo-Archaic" adaptation that was the basis of later Great Basin desert culture (Aikens 1993:26).

Moreover, Willig (1988) concludes that Western Stemmed technologies appear to belong more to Early Archaic times rather than the Paleoindian era because of their common association with grinding stones rather than with extinct faunal remains.

Much like the distributions of fluted weaponry, stemmed point technologies have been widely found across areas adjacent to the central Oregon Cascades. Pre-10,000 B.P. stemmed point assemblages discovered in the Great Basin and Columbia Plateau have been designated *Haskett* (Sargeant 1973) and *Windust* (Rice 1972), respectively. Contemporaneous artifacts have also been found in central Oregon at Fort Rock Cave (Bedwell 1973) and 8,200-year-old assemblages have been documented just east of the Cascades proper at Newberry Crater (Connolly 1990) and Lava Island Rockshelter (Minor and Toepel 1984). Unfortunately, verifiable Paleoindian finds have yet to be unearthed at any mountainous lakes or other upland areas in the Cascades.

However, an apparent cultural anomaly found in the Klamath Mountains of southwestern Oregon may suggest that early Native American groups may have used or had knowledge of the central Oregon highlands. Brauner and Nisbet (1983:90-91) report that artifacts left at Site 35JA53 near the confluence of Squaw Creek and the

Applegate River appear to be the remnants of a seasonally occupied hunting and gathering camp used by a small group of people who may have been part of the upper Applegate River valley's pioneering human population. In addition to experimenting with a wide range of local rock types and an apparent lack of familiarity with local lithic sources, the site's occupants left diagnostic tool forms that have no obvious cultural antecedents in the surrounding area.

Of particular interest at 35JA53 are stemmed projectile points with short, broad triangular blades; no similar artifact assemblages have been documented in the Pacific Northwest with the exception of some affinities shared with Windust phase material reported from the lower Snake River (Rice 1972:76). Likewise, geologic context and typological comparisons indicate the site predates 8000 B.P. (Brauner 1978). Such correlations suggest the people and materials from 35JA53 may share a common cultural ancestor with the Columbia Plateau's Windust culture. Overall, the archaeological data suggests that human populations migrated into the Applegate River drainage from the north or northeast. If this assumption is correct, similar and ancestral cultural manifestations should exist in the central Oregon Cascades, particularly along the western foothills and down the major drainages that emerge from the uplands (Brauner and Nisbet 1983:92)

Early Archaic Period

Increasingly arid climatic conditions beginning around 12,600 B.P. and persisting through the Altithermal forced Native American populations in the Pacific Northwest to face a variety of new environmental pressures. The large Pleistocene megafauna became extinct; lakes shrank, rivers stopped flowing and springs dried up; and cool weather-adapted plants and animals began retreating northward to higher elevations or faced local extinction. Despite short-term reversals, the warming trend continued until about 8000 B.P. (Mehringer 1986:49). The result was a major readaptation by aboriginal peoples to include a wider variety of smaller game and more vegetal foods in their diets. This diversification was made possible by seasonal migrations between uplands and valleys to capitalize on the changing seasonal abundances of plants and animals.

The period between 10,500 and 7000 B.P. is considered a transitional stage between the Paleoindian traditions and full Archaic lifeways (Fagan 1988; Willig 1988). In the Columbia Plateau, Windust projectile points remained a common tool kit item until the introduction of Cascade and Northern Side-notched varieties around 8000 B.P. (Leonhardy and Rice 1970; Leonhardy 1975). Similarly, the Western Stemmed tradition also persisted in the Great Basin until being replaced by Cascade and Northern Side-notched atlatl tips approximately 8,000 years ago. Although both of the latter types are commonly found together, Cascade points appear to have been introduced several hundred years earlier than the Northern Side-notched (Jennings 1986:Figure 3; Aikens 1993:23).

The continued presence of stemmed points in the Early Archaic archaeological record suggests that peoples living in areas near the central Oregon Cascades still got the bulk of their diet from big game hunting. However, increasing subsistence emphasis appears to have been placed on the use of vegetal foods. A more-generalized adaptation to the warmer and drier climate is implied by an increasing frequency of milling stones, manos, gravers, knives, scrapers and anvil stones, each showing better workmanship than earlier variations (Cressman 1986:122). All these changes can be considered internal and developmental, an indication of successful adaptation to the changing environment.

Archaeological research in the northern Great Basin has revealed a pattern of Early Archaic sites in association with lowland lakeshores and marshlands (Bedwell 1973; Pettigrew 1984; Willig 1988; Pettigrew and Lebow 1989; Aikens and Jenkins 1994). The concept of the Western Pluvial Lakes Tradition has been proposed to explain the subsistence and settlement shifts that appear so blatent during this period:

> ...The large herd animals (especially the mammoth, but possibly including the horse and large bison) had been decimated, and it became necessary to focus on a more reliable and diverse set of resources, including a variety of plants and animals on the still-wet bottomlands. Base camps were located on the margins of lakes and marshes, and seasonal hunting and gathering zones were limited to mostly lowland areas, since ecozones still had not risen to substantially higher elevations and food sources in the lowlands, including big game, waterfowl, and vegetable foods, were dependable and abundant. Use of upland areas...was slight. Human populations in the lowlands...appear to have been quite substantial, probably as much as any later period. The abandonment of this lifeway may have occurred as early as 8000 B.P....if the lakes and marshes upon which the human populations and their food sources depended disappeared at that time, as one might infer from Mehringer's (1985) data. The rate of decline of such bodies of water likely would have depended on factors such as latitude, elevation, characteristics of their drainage basins, and their size, and some lakes and marshes probably would have lasted longer than others (Pettigrew and Lebow 1989:84-85).

Lebow et al. (1990:59) suggest that the transition from the Paleoindian to Early Archaic Period in the northern Great Basin may have been characterized by no distinctive adaptive focus or settlement pattern, possibly as a response to the region's dramatic environmental changes:

> ...The demise of the large mammalian herds made dependence upon them untenable and required expansion of the subsistence base to include resources (still largely animals) whose exploitation demanded more detailed knowledge of local habits, availability, and distributional patterns. Foraging territories therefore became more areally restricted, and settlement systems more logistically organized, though not to the extent witnessed in the later millenia. Bands remained small and integrated at the family level, but at least in places with resource abundance population densities rose dramatically, as a consequence of reduced demands for travel, improved efficiency of resource extraction, and a favorable moist, mild, and biotically productive environment. Subsistence remained dependent largely upon faunal resources, with a bias toward large mammels where they were abundant, but including also smaller mammels and waterfowl...A lack of food preservation technology, as suggested by Schalk (1980:29; 1987:10-20) may have limited population densities in areas where wintertime food availability was restricted. As a corollary, site placement, much more than in later periods, may

> have been governed by the seasonal location of animal food resources.

If this model is accepted, the highest proportion of Early Archaic sites would be expected to occur in lowland areas where faunal and fish abundances were high year-round. Conversely, the uplands and other locations with minimal access to water or specialized plant concentrations would tend to show little exploitation by people. Thus, remnants of an Early Archaic human presence in the Cascades would be expected to manifest as artifacts left by small groups making short-term, seasonal visits focused on migrating herd animals, fish runs and plant foods appearing during seasonal blooms.

To date, very little and inconclusive evidence has been unearthed proving the existence of Early Archaic use of high lake areas in the central Oregon Cascades. Cressman (1948) offered tantalizing evidence of a pre-7000 B.P. lakeside occupation at the Odell Lake Resort Site with the discovery of several lanceolate-shaped bifaces, ground stone and flaked debitage resting on glacial till below undisturbed Mazama pumice deposits. Originally hailed as the remains of a "Paleo-Indian" campsite, the age of the material was never pinpointed by radiocarbon or other modern dating techniques. Later investigations at this and other sites around the lake have revealed a greater abundance of cultural materials that tend to point toward the lake's use as a seasonal hunting and processing area (Snyder and Davis 1984; Stuemke 1986; Flenniken et al. 1988; Rushmore and Burney 1992; Jaehnig 1994). Although preserved organic samples associated with cultural debris have been relatively scarce, the earliest radiocarbon date from Odell Lake has been calibrated to about 7,500 years ago (Jaehnig 1994:61).

Similar artifacts have been found northeast of Odell Lake in the upper Deschutes River Basin. Two obsidian bifaces were recovered beneath Mazama pumice in glacial debris during construction of the Wickiup Reservoir Dam (Cressman 1937), but subsequent test excavations turned up no additional cultural material. Other Upper Deschutes sites with Early Archaic components include the Three Sheep

Rockshelter (Ross 1963), 21 Divide and McKay Crossing Sites (Stuemke 1989b), Prairie View Site (Stuemke 1989c), Eagle Crest Site (Gibson and Pettigrew 1989) and possibly Lava Island Rockshelter (Minor and Toepel 1984; Scott and Davis 1984).

The Western Cascades have also yielded an abundance of cultural items suggestive of people wandering around the uplands prior to 7000 B.P. Occupations radiocarbon dated to as early as 7910 B.P. were discovered near the South Santiam River in Cascadia Cave (Newman 1966). Discarded tools such as knives, scrapers, utilized flakes, grinding stones, manos and animal bones found in numerous stratigraphic levels imply that the site was used repeatedly by seasonal hunting and gathering groups. Perhaps the most distinctive items from the cave are the numerous leaf-shaped "Cascade" projectile points recovered from the lowest stratum. These large bifaces are most-likely atlatl dart tips and are present in levels dating to about 5960 +/- 280 B.C.

Similar artifacts have been found further south at Baby Rock Shelter on the Middle Fork of the Willamette River (Olsen 1975). An assortment of notched projectile points, knives, scrapers, gravers, perforators and other tools associated with hunting and hide working were recovered above and below Mazama pumice deposits. Although no ^{14}C dates were obtained for the site, projectile point styles similar to those found at Cascadia Cave suggest an overlapping period of occupation. A comparable hunting and gathering tool kit of similar antiquity was discovered near the North Umpqua River at the Medicine Creek Site (Snyder 1981). Projectile points, scrapers, bifaces, utilized flakes, hammerstones, choppers and waste flakes were found in both pre- and post-Mazama levels, including a stemmed, leaf-shaped biface which came from the paleosol .

In summary, it is reasonable to suggest that the central Oregon Cascades were visited and exploited during the Early Archaic. However, the problem lies in finding the evidence. Explanations for the limited number of Early Archaic mountainous sites may be more-related to the physical environment's ability to hide what's there rather than intentional prehistoric avoidance. Terrain inaccessibility, dense ground cover and stratigraphic mixing due to ongoing ground-disturbing geologic and biological processes have probably contributed to the concealment of old sites. Likewise, if upland locations were visited by small groups on a short-term or seasonal basis, it would be reasonable to expect that discarded cultural debris was limited in both quantity and areal extent. Furthermore, the thick blanket of Mazama pumice that covers much of the region has probably deeply buried many early sites, as shown by the stratigraphic contexts of most Early Archaic assemblages already found in the Cascades.

Middle Archaic Period

By the beginning of the Altithermal climatic regime around 7,500 years ago, the peoples of the Columbia Plateau and northern Great Basin had made dramatic changes in their ways of life. With the exception of a few climate reversals near the end of the Anathermal, the long period of drying and increasing temperatures combined with possible pressures from growing populations to force the inhabitants to develop new and specialized economic, subsistence and settlement strategies. Pettigrew and Lebow (1989:84-89) describe the period between 7000-5000 B.P. as a time when "transitional Archaic" adaptive patterns were developed for survival and prosperity in a number of specific environments. Environmental constraints are believed to have

> stimulated the development of techniques to hunt solitary game mammels with notched projectile points, and to invest in the labor-intensive and expanded use of dryland seeds and roots, which were processed most efficiently with grinding stones. At the same time, where salmon were available (and their availability might have declined during periods of drought), increased fishing would have been very adaptive, especially in conjuntion with the development of effecting drying or smoking techniques. The adoption of labor-intensive food collection techniques, combined with new harvesting and processing technology, created a new economy in which stored foods allowed people to structure their foraging habits and take up a logistical system with a

> central home base, even in areas that formerly were marginal because of seasonal scarcity (Lebow et al. 1990:68).

Cultural and geographical distinctions between the northern Great Basin and Columbia Plateau became readily apparent during the Middle Archaic period. While the peoples of the Great Basin are believed to have become dependent on seasonal rounds between upland hunting-foraging areas and lower collecting and plant food processing locations, a pattern of winter village settlement and subsistence began to appear in the river canyons of the Columbia Plateau. This dichotomy of adaptive strategies became further elaborated throughout the Altithermal, eventually developing into the distinctive lifeways that later came to define the vast cultural differences between the two regions.

Diagnostic projectile point styles used in the Columbia Plateau during the Middle Archaic are very similar to those found in the northern Great Basin. During the waning days of the Early Archaic period around 8,000 years ago, Cascade and Side-notched point use began to spread throughout the Plateau (Leonhardy and Rice 1970). These large dart points are commonly found in sites dating to the Cascade Phase (8000-4500 B.P.). The appearance of triangular points with contracting stems, side notches or corner notches ushered in the Tucannon Phase around 5500 B.P. (Lucas 1994:89-99), roughly corresponding with the emergence of Pinto and Elko Series styles in the Great Basin. Tucannon varieties persisted until the introduction of the bow and arrow at the beginning of the Harder Phase around 2500 B.P. This weapons system transition is marked by the appearance of Snake River Corner-notched, large and small basal-notched points, analogous to the Great Basin cultural shift to Elko, Eastgate and Rose Spring Series varieties during the same period (Aikens 1994:95).

Schalk (1987:10-23) suggests that clusters of pithouse dwellings first appeared on the steppe-forest margins of the Columbia Basin around 5000 B.P. Such settings are presumed to have been an optimal choice because they offered easy access to upland hunting areas, lower collecting zones and fishing grounds. Archaeological remains from a number of Plateau sites indicate that hunting was still the primary subsistence focus during the early part of the Middle Archaic, although collecting and fishing became increasingly important through time. Lebow et al. (1990:69) further elaborate on Schalk's theory by postulating that north-central Oregon's earliest housepit sites may have been occupied by single or small extended family groups living in either the John Day Canyon on the northern flank of the Ochoco Mountains or near the lower Deschutes River along the eastern base of the Cascades.

By 3000 B.P., population growth among the riverine-adapted peoples is believed to have brought about an intensification of subsistence activities (Lebow et al. 1990:69). This may have led to a greater investment in salmon fishing and expansion of settlement along the middle Columbia River and other areas with bountiful fall fish runs. Similar changes may have also occurred along the Deschutes and lower John Day River. Both drainages saw dramatic increases in occupation by the end of the Middle Archaic and during the Late Archaic Period (eg., Dumond and Minor 1983; Wilde et al. 1983; Schalk 1987).

The location of villages along the Columbia River during the Middle Archaic has important implications for the location of similar-age sites in the mountains of central Oregon. The Deschutes River could have served as an upland trailhead for people living near or visiting the middle Columbia River. Hunters and gatherers traveling through the Columbia River Basin would have first encountered the Deschutes River halfway between Celilo Falls and the mouth of the John Day River. It could have then been followed southward along the eastern fringe of the Cascades and eventually to the upper headwaters at Davis, Odell and Crescent Lakes. The march of people along this watery highway can be traced archaeologically by housepit depressions and other signs of stable occupation at various locations along the lower end of the Deschutes River. As the drainage's upper reaches are approached, "small and scattered sites are the rule, probably the hunting and gathering camps of small groups ranging out from village centers" (Aikens 1993:117).

Numerous well-documented Middle Archaic sites stretch between the lower reaches of the Deschutes River and its headwaters on the eastern flanks of the Cascades. Representative examples where hunting, gathering and fishing activities took place include the Mack Canyon Site (Cole 1967, 1969), several rockshelters near Round Butte (Cressman 1963; Ross 1963), Lava Island Rockshelter (Minor and Toepel 1984), Peninsula 1 Rockshelter (Stuemke1989), the Inn of the Seventh Mountain (Minor et al. 1988) and Lava Butte (Ice 1962; Davis and Scott 1984). Sites found at higher elevations further upstream appear to reflect more-temporary, seasonal occupations. Some of the more prominent upland sites occur at the Ryan Ranch (Scott 1985a:52-57), Sunriver (Cole 1975, 1977), the Dusty Mink and Grayling Springs sites on Fall River (McFarland 1989a), Davis Lake (Snyder 1982; Scott 1985a:58-61) and Odell Lake (Jaehnig 1994). Further discussion of the archaeology of the Upper Deschutes River can be found in Davis and Scott (1986) and McFarland (1989a).

Although the northern Great Basin underwent similar environmental changes during the Altithermal, the peoples' responses were somewhat different from those of the Columbia Plateau cultures. After the extinction of the Pleistocene megafauna, Great Basin groups turned their focus toward smaller animals, birds, fish and a variety of seeds, nuts and root plants. Grinding stones, baskets and other appropriate technology for food processing began to proliferate. Rather than settling into semi-permanent village locales, small Great Basin groups developed a highly-mobile lifestyle based on seasonal movements between hills and valleys in search of temporary plant and animal abundances. To accommodate such an active livelihood, material cultures had to become relatively simple, reflecting the need for adaptability to a number of environments.

Tool kits in the northern Great Basin changed dramatically during the Middle Archaic. In addition to the greater use of plant processing tools, a multitude of new and smaller projectile points began appearing between 8000 and 7000 B.P., particularly corner-notched varieties. Bone flaking tools came into vogue and changes in stone flaking technology possibly signifying the beginnings of pressure flaking also occurred (Cressman 1986:122). The preferred weapons system was the atlatl, complete with side-notched, corner-notched, stemmed and leaf-shaped dart point styles. Hallmark Great Basin projectile point types that proliferated during the Middle Archaic include the Cascade, Northern Side-notched, Humbolt, Pinto, Gatecliff and Elko Series (Hester and Heizer 1973; Thomas 1981; Jennings 1986:Figure 3).

Technological analyses of lithic assemblages found throughout the northern Great Basin have revealed a bifacial reduction pattern that appears to have been widely practiced during the Middle and Late Archaic periods. Flenniken (1987) and Flenniken and Ozbun (1988) have suggested that boulders located immediately adjacent to obsidian sources served as quarries for tool blank manufacture. Initial reduction was completed at or adjacent to quarries, and secondary reduction occurred at sites surrounding the obsidian sources. Flaked blanks or cores were then transported to other areas where further reduction and flaking would have occurred to produce preforms and/or finished tools. The validity of this centralized quarry to satellite reduction area concept is supported by lithic sourcing and reduction sequence evidence that correlate many of central Oregon's known quarry areas with sites stretching from the High Lava Plains to the Cascades (Flenniken 1987; Flenniken and Ozbun 1988; Scott 1985a, 1985b; Stuemke 1989a, 1989b; McFarland 1989a; Matz 1990).

A related conundrum has been sparked by the discovery of lithic caches stashed in various locations between the uplands and flanking high desert areas. Debate has focused on possible functions of the materials, with speculations centering on their possible roles as preforms or "blanks" for the production of corner- and side-notched projectile points (Scott 1985b), hunting tools (Minor and Toepel 1984, 1989), non-utilitarian burial goods (Green et al. 1986) or trade items (Scott et al. 1986, 1989). Although the ages of these stockpiles are another point of contention, most are believed to post-date the 6800 B.P. eruptions of Mount Mazama. At present, seven lithic cache classes have been identified based on the technical attributes of the known specimens (Swift n.d.): (1) flake blanks; (2) bifacial cores; (3) large percussion-flaked ovate unifaces and bifaces; (4) large percussion and pressure-flaked pentagonal unifaces and bifaces; (5) small lanceolate-shaped rough outs; (6) small lanceolate-shaped preforms; and (7) small lanceolate-shaped bifaces that may have been hafted.

The cataclysmic eruptions of Mount Mazama and subsequent tephra deposition between 7000-6800 B.P. undoubtedly had a profound impact on the lives of people living in much of the Pacific Northwest. Ash and pumice deposits in the Crescent Lake area alone average approximately one-meter deep. Traces have also been found as far away as the Yukon, Alberta, northwestern Utah and the Sierra Nevada Range (Mehringer 1977:125). Unfortunately, few investigators agree on the nature and severity of Mazama's effects on the environment and human sociocultural systems. Scenarios range from catastrophic impacts resulting in widespread biological devastation, cultural chaos and regional abandonment (e.g., Williams 1941; Fryxell 1963; Malde 1964; Bedwell 1973) to little or no effect at all (e.g., Bense 1972; Grayson 1979; Thomison 1987).

Although proximity to the mountain probably played a key role in determining the overall impact of the eruptions, a host of factors likely helped to drive the variable biological and sociocultural responses observed throughout the region. Perhaps the most comprehensive study of Mazama's influence on the interplay between floral, faunal and human populations was that of Matz (1991). An anthro-ecological model was designed to help examine the influence of the eruptions on natural ecosystems and how human populations may have been subsequently affected. Matz proposes that ecosystem disturbances caused by environmental events such as tephra-falls can place stress on sociocultural systems if plant and animal populations which are depended upon for subsistence are altered:

> The people, through the technoeconomic subsystem of the sociocultural system, attempt to reduce the impact of the stress by changing their adaptive pattern. This is reflected both in their utilization of space for hunting

> and gathering of food stuffs and in their tools which are used for subsistence activities. If such a change is correlated to expected changes in the local ecosystem due to environmental stress, the changes in the sociocultural system may be due to the environmental stress. Of course this supposes that the environmental stress will have a profound enough effect on the sociocultural system to overcome the built in resiliency of the system (1991:24).

According to the Matz model, varying intensities of tephra-falls across the landscape would have differentially fouled the environment and altered the abundance and availability of food resources (i.e. greater fallout meant more alteration or devastation and less productivity). Depending on the severity of ecological change, human populations are predicted to have responded with (1) little or no change in their sociocultural systems; (2) endurance of most environmental changes, with minor sociocultural adjustments occurring in the use of peripheral traits or behaviors (e.g., temporary focus on diffuse adaptations such as reliance on starvation foods); or (3) creation of new behaviors and traits if the established sociocultural system could not absorb the ecosystem change by incorporating peripheral traits or behaviors. Such fundamental changes in the sociocultural system would be necessary in order to cope with long term disturbances to the environment (1991:24-26).

Hellish conditions likely prevailed across much of the central Oregon landscape immediately following Mazama, although how the people living in the Cascades reacted remains a mystery. Given the relative closeness of the volcano to Crescent Lake (approximately 37 miles away), it would be reasonable to suggest that the surrounding upland environment was rendered temporarily uninhabitable or undesirable for an undetermined period immediately following the final eruptive phase. The intense rain of tephra over the area would have likely devastated almost all low herbaceous vegetation, shrubs and many tree species (Matz 1991:88-89). The resulting cloak of deposits probably destroyed fragile ecosystems and either precluded vegetation recolonization or led to very long recovery rates.

At such depths, it is just as likely that successional species better-adapted to the new conditions could have recolonized the devastated areas. These circumstances probably led to drastic reductions in mammel, bird, fish and insect populations through death, abandonment of the area for a period of time or a combination of both. Human populations almost certainly responded in kind with changes in resource exploitation, subsistence activity location and functional tool design. "While seemingly fundamental structural changes could have occurred in sociocultural systems, with a lessening of the stress the new or peripheral patterns of subsistence activities could have been abandoned for the predisturbance patterns" (Matz 1991:89). Attempting to trace any eruption-related adaptive changes through the archaeological record, however, would be extremely difficult unless the new patterns persisted for a prolonged period or were permanently adopted for their adaptive advantage.

To date, little effort has been made to apply Matz's (1991:81-100) conclusions about the timing, possible sociocultural and ecological consequences of the Mazama eruptions to high elevation lake areas in the central Oregon Cascades. Although additional archaeological and geomorphological work must be conducted at Crescent Lake and other mountain lakes to confirm and/or refine Matz's volcanic effects model, the scenarios that are proposed and addressed can be used to develop a better understanding of what people living in the central Oregon Cascades may have faced during and after the eruptions:

(1) Individual tephra-fall events were of short duration and are believed to have occurred during the autumn, late spring/early summer and possibly during a single winter season;

(2) The seasonality of the eruptions could have directly and specifically affected the reproduction and food gathering schedules of individual organisms and populations;

(3) Spring and summer month tephra-falls would have been most devastating to plants and insects by disrupting the peak periods of photosynthesis, pollination and production;

(4) Animals would have been differentially affected by seasonal tephra-falls (i.e. autumn and winter events would have restricted breeding schedules; spring and early summer eruptions could have led to higher rates of juvenile mortality); and

(5) Human and animal populations could have faced higher instances of stress, starvation and mortality if the eruptions occurred during periods when food and fat reserves had been used up or needed to be replenished (eg., during early spring or late summer/early autumn).

> For people, the season of tephra deposition would have had an effect on scheduling of resource exploitation and of travel for social occasions. A seasonal round of upland plant and animal exploitation and/or fishing during the tephra-fall events many have been restricted, due to an inability to reach the proper locale if tephra deposits are thick enough or if the tephra-falls cause specific seasonally exploited plants and animals to decrease in availability. Semipermanent and permanent villages or encampments with sufficient food stored away, would not have been as affected as highly mobile foragers and hunters dependent on fresh foods. People who relied on focal adaptive strategies based on seasonally restricted food sources, such as anadromous fish runs, would have suffered greater hardship than more diffuse adaptational sociocultural systems if a heavy tephra-fall occurred at a critical time (Matz 1991:87).

At present, substantive data suggestive of Mazama's role in cultural change or stability in the central Oregon Cascades is extremely rare. However, one site in the southern Oregon Cascades may provide an analogous situation to that experienced by people exploiting other parts of the upland chain prior to and after the eruptions. Snyder (1981:5) has interpreted tool kit changes at Medicine Creek as a direct response to the tephra falls. "Distinct qualitative and quantitative cultural differences" in the artifacts as well as a striking decline in occupation intensity were noted between pre- and post-Mazama deposits. Whether these exploitation changes resulted due to natural events, cultural factors or a combination of both has yet to be determined.

Similar reductions in artifact concentrations have also been found above Mazama deposits in the Fort Rock Valley. Some researchers have interpreted these declines as evidence of a long-term cultural hiatus away from the low-lying lake bed areas of the northern Great Basin and toward upland spring sites soon after the eruptions (Bedwell 1973; Fagan 1974; Aikens 1986:13-15; Cressman 1986:122). Estimates for the length of the exodus range from several decades to perhaps two thousand years. The bulk of the lowland reductions appear to have occurred between 7000 and 5000 B.P. Whether the Mazama eruptions, increasingly arid conditions during the Middle Archaic, a combination of both or some other undetermined factors helped induce the lacustrine-adapted folk away from the lowlands during this period remains unknown. Matz (1991:95) suggests the answer may lie somewhere in the middle, with the eruptions serving as the final nudge that pushed groups of people already driven to their tolerance limits by the long drying trend over the edge.

Fagan (1974:105) argues that subsistence activities established in the northern Great Basin by the end of the Altithermal consisted of foraging and seed processing at low elevations (4,000 to 5,000 feet) and hunting in the uplands (5,000 to 6,000 feet). Archaeological remains such as dart points, grinding implements and other tools reflective of similar subsistence patterns have also been found at a number of post-Mazama sites on the eastern flanks of the Cascades and Deschutes River Basin (cf., Ice 1962; Cole 1975, 1977; Davis and Scott 1984, 1986; Minor and Toepel 1984; Scott 1985a, 1985 b; Flenniken and Ozbun 1988; McFarland 1989a; Connolly 1990).

Responses of Columbia Plateau peoples to environmental change brought on by the Mazama ashfalls and Middle Archaic climatic fluctuations appear even more variable than those observed in the northern Great Basin. Possibly the most conspicuous indicator of cultural change among Plateau folk immediately following Mazama is the widespread appearance of Cold Springs side-notched projectile points in numerous sites throughout the lower Snake River country (Butler 1961; Shiner

1961; Galm 1975). Although the riverine-focused peoples probably knew of this technology prior to 7000 B.P., it was presumably not until after the eruptions ravaged their stream-side subsistence base that they viewed the point style and its associated weapons system as offering an adaptive advantage in their quest to place greater economic emphasis on game hunting in the uplands (Galm 1975; Lucas 1994;78-80).

Major residential changes also appear to have taken place in the Columbia Plateau in the wake of Mazama. A several-hundred-year abandonment of eastern Washington's Marmes Rockshelter appears to have occurred following Mazama's final eruption (Fryxell 1963), and changes in both subsistence and settlement patterns along the lower Snake River are also attributed to the resulting pumice pileup (Galm et al. 1981; Bense 1972; Hammett 1976). Although the degree, timing and duration of the impact are highly-debated, Brauner (1976) proposes that ash slurries found in tributary channels and arroyos throughout the Columbia Plateau and northern Great Basin may indicate that the eruptions disrupted normal weather patterns and lead to a brief period of increased storm activity. Whether such volcanically-induced climate changes would have lessened the environmental impact of the tephra build up or served as another impetus for people to migrate elsewhere and/or adopt new economic strategies is currently undetermined.

Despite the growing evidence suggesting the Mazama eruptions had a profound effect on the ecosystems of the Pacific Northwest, it appears that changes were by no means catastrophic to the established socioeconomic systems of peoples living in the region. Matz's (1991) findings, although somewhat tentative due to data base limitations, suggest that cultural adjustments made in response to the volcanically-induced environmental changes might be better viewed as the natural progression of ingenious hunters and gatherers trying to maintain as much as possible the lifestyle they had successfully forged through the millenia:

> Why is there so little evidence of change in the archaeological record if such utter destruction as seen in central Oregon and increased ecological disturbance as postulated in the Lower Snake River canyon had occurred? The answer may lie in the

> adaptability of the native inhabitants. Within the Great Basin, the people were able to exploit a wide variety of resources and resource locations. On the Columbia Plateau, even if the people did rely on the fish runs, they still had not abandoned the use of other floral and faunal resources. The tool kits and knowledge were available to adjust to the changing conditions, at least until the old ways could be reestablished (Matz 1991:99).

A cultural shift toward greater sedentism appears to have occurred in many parts of the northern Great Basin beginning around 5,000 years ago. This trend is coincident with the gradual amelioration of the harsh Altithermal climatic regime into more-temperate Medithermal weather conditions. The discovery of pit house depressions in southeastern Oregon along the Abert Rim (Pettigrew 1980) and cultural midden material in the Warner Valley (Weide 1974) suggest that sedentary communities began to appear in the high desert as early as 5000 B.P. The shoreline of nearby Lake Abert has also yielded rock-outlined house patterns and artifacts indicative of long-term lakeside occupations persisting from approximately 4500 B.P. to A.D. 1500 (Cressman 1986:125).

Similar scenarios of population growth and increasingly sendentary settlement are theorized for the northwestern, north-central and eastern portions of the Oregon's Great Basin territory. Variable demographic shifts toward higher elevations accompanied by the establishment of increasingly-complex winter settlement sites and base camps are especially notable between 4500-2000 B.P. (Aikens 1978; Elston 1982; Madsen 1982; Thomas 1982). Disruption of lacustrine and marshland habitat productivity by the wetter climate at the beginning of the Medithermal may have induced people to seek out a better life in the uplands until previously-favored bottom land areas stabilized, although some debate still lingers over the severity and duration of lowland habitat devastation (cf., Elston 1982:195-199; Madsen 1982:215-216).

Remains of long-term occupations have also been unearthed in the Klamath Basin of south-central Oregon. Cultural assemblages from the Nightfire Island Site on the western edge of Lower Klamath Lake demonstrate that lakeside fowling, fishing and plant gathering took place there for some 6,000 years (Sampson 1985). The site appears to have funtioned intermittently as a long-term winter encampment and a temporary fishing, hunting and gathering area. The period between 4000-2000 B.P. was a time of permanent to semi-permanent residence, most-notably marked by remnants of clay-lined house floors. Lighter dwelling structures appeared between 3000-2000 B.P., possibly signaling the beginnings of less-intensive occupation. Heavy exploitation of plants and animals near the site is thought to have continued until shortly after A.D. 1000, after which the area was probably abandoned (Cressman 1986:125).

The enduring cultural continuity suggested by the Nightfire Island artifact inventory bolsters Cressman's (1956) contention that the ethnographically-known Klamath culture of south-central Oregon extends deep into the past. The archaeological record of Nightfire Island chronicles at least 6,000 years of occupation by peoples who, despite brief periods of site abandonment and/or changes in their available subsistence base and environment, were able to do many of the same things their ancestors had been doing for several hundred generations. The discovery of comparable artifacts and cultural relationships at other sites in the Klamath Basin (eg., Aikens and Minor 1978; Silverman 1989; Cheatham 1991) and the historic presence of Klamath peoples in areas immediately southeast of the Cascades' eastern periphery may have important implications for the establishment of cultural links with similar-age sites found in the uplands of central Oregon.

The adoption of bow and arrow technology in favor of the atlatl and dart is thought to have occurred throughout the Pacific Northwest sometime near the end of the Middle Archaic. Although little information is available for an accurate assessment of when this innovation was introduced to the Cascades, studies from the surrounding cultural areas can be used to track the transformation:

> The transition between the use of the atlatl and dart and the adoption of the bow and arrow is reasonably dated. At Dry Creek Rockshelter near Boise, Idaho, a single arrow point was found in Level 12 which produced

> a radiocarbon date of 3270 BP. They were well established at the site by Level 10, from which a radiocarbon date of 2090 BP was reported (Webster 1978, 1980). At Dirty Shame Rockshelter in southeast Oregon, arrow points appear shortly after 2700 BP (Aikens, Cole and Stuckenrath 1977:22). Evidence from sites on the Middle Columbia River (Dumond and Minor 1983:160) and the Lower Snake River (Brauner 1976:320-321) indicates that arrow points had become predominate in archaeological assemblages in the region around 2000 BP (Minor et al. 1987:39).

Late Archaic Period

The period from about 2000 B.P. to contact with Euroamericans appears to be marked by a continuation and amplification of subsistence and settlement traditions established during the Middle Archaic. The archaeological data base from the region encompassed by the Cascade Range, Columbia Plateau and northern Great Basin exhibits no major cultural adaptation changes during this time, although minor stylistic and morphological variations began to appear in some tools (eg., projectile points) between individual cultural areas. Minor settlement shifts also took place in the Columbia Plateau and northern Great Basin, but these may be more-properly viewed as residential and economic adjustments rather than significant lifeway changes. By contrast, too little information has been assembled concerning the habits of people roaming the Cascade Range highlands to determine the extent of any Late Archaic cultural changes that may have occurred there.

The trend toward climatic and environmental stabilization that began near the end of Middle Archaic set the stage for the blossoming of cultural traditions that became prevalent throughout the Columbia Plateau during the Late Archaic. As the period of more-effective precipitation began to wane around 2,500 years ago, erosion and runoff rates leveled off to a point where salmon populations were able to come back in exploitable quantities. A major flowering of human populations began to take place as Plateau groups, now armed with efficient technologies and knowledge which allowed them to exploit and live off a diverse subsistence base of plant foods, riverine resources and upland game, began moving down from higher elevations and back into the river canyons (Brauner, personal communication). These cultural readjustments helped initiate the beginnings of the so-called "ethnographic culture" patterns that prevailed until the onslot of the Contact Period during the early-1800s (Nelson 1969).

The basis for the economic and settlement systems practiced by Late Archaic cultures of the Columbia Plateau was centered on the following of "spring" (Brauner, personal communication). After spending the winter months congregated in multiple-family, semi-subterranean house villages at the bottom of river canyons, groups would begin to filter outward (between late-March to mid-April) toward temporary encampments on terraces above the rivers to resume the search for camas, biscuit root, wild onions and other early spring root plants. By late-May, the quest for ripening plant foods would have taken the people into the adjacent uplands where the same suite of resources could now be intercepted.

Early-summer was spent in the foothills of the Blue Mountains, Cascades and Bitterroot Range at base camps harvesting highland plant blooms and hunting game. The seasonal cycle began to wind down by late-summer as the people descended back into the river canyons to exploit the fall salmon runs. As winter approached, the canyon bottom settlements were again occupied and stored food supplies and occasional hunting forays tied the Plateau folk over until the return of spring.

The spring-based Plateau lifeway persisted for the duration of the Late Archaic. Tool technologies demonstrated a high degree of craftmanship, especially in the production of small arrow points. Other common toolkit items from the period include pentagonal knives, assorted grinding and milling stones, pestles, hammerstones, net sinkers and chopping tools. By 1000 B.P., village amalgomation began to occur and dwelling structures became more-rectangular or stretched-out in appearance (Brauner, personal communication).

The cultural integrity of Columbia Plateau groups remained relatively stable for at least another 700 years. However, major lifestyle changes were set into motion by the early-1700s after the Shoshone and other northern Great Basin peoples began introducing the horse to the region (Shimkin 1986:517-519). Subsequent contact with Euroamerica was to be the final blow that would forever change the long-standing traditions of the Columbia Plateau.

People living in the northern Great Basin during the Late Archaic displayed a similar propensity for maintaining and honing cultural traditions developed during the preceding period. Having already adapted to a life based on seasonal variability, mobile groups had now become specialized at focusing their dependence on whatever resources they could find during their seasonal rounds. Tubers, roots and other edible plants were gathered during stays near lowland spring areas; migrating waterfowl, fish, pronghorn, and bison herds found in abundance near valley lakeside habitats were hunted; forays into the uplands were conducted to pursue bighorn sheep, deer, elk and other game; and seasonal foothill plants such as pinon pines, nuts and seeds were gathered as dietary adjuncts.

A population expansion of Numic-language peoples engulfed all but the Klamath Lake area of northern Great Basin sometime after A.D. 1000 (Cressman 1986:126). Although the reasons behind this massive northward push by southern groups are not fully understood, oral traditions passed on by some of the region's ethnographic cultures describe encounters that may be considered descendant ripples of the earlier Numic wave. Tales among the Tenino speak of skimishes with Northern Paiute invaders as far north as the Columbia River (Murdock 1938; Ray et al. 1938:391) and the Northern Paiute themselves have stories of forcing the Klamath to the west (Kelly 1932:186).

The archaeological record of the Numic advance is equally silent, its meager vestiges primarily limited to a few characteristic pottery sherds from Catlow Cave in southeastern Oregon (Cressman et al. 1942). Despite the apparent lack of rhyme or reason for the Numic incursion, it is evident that the newcomers were either already accustomed to or quickly adopted the seasonal hunting and foraging pattern practiced by the region's earlier inhabitants. The transhumant lifeway persevered until the end of the eighteenth century, after which the introduction of the horse and

Euroamerican cultural influences rapidly contributed to the inevitable breakdown of the northern Great Basin's native social structures.

The picture of Late Archaic life in central Oregon's Cascade Range is equally obscure due to the lack of information and ambiguity. The habits and settlement patterns of people roaming the highlands during this time remain poorly understood, possibly because only a few of the extremely-limited number of upland areas investigated have revealed patterns distinctly different from those of the preceding period (eg., McFarland 1989a; Stuemke 1989a). Furthermore, the location of most areas inspected in the mountainous fringes have been dictated by federally-funded projects that only required brief scrutiny or mitigation prior to development. Such mandates are often not the best way to locate places which could provide important insight into the prehistoric use of the uplands.

At present, the most-noteable study of Late Archaic land use in central Oregon's hinterlands comes from McFarland's (1989a) exploration of sites scattered across the upper Deschutes River Basin. Investigations at the Dusky Mink and Grayling Springs sites along Fall River uncovered a wide variety of broken, discarded and resharpened arrow points, preforms and pressure flakes presumably no older than 2,000 years. Similar cultural material including projectile points akin to late-phase northern Great Basin types (eg., Rosespring styles) and Columbia Plateau varieties have been found in the Late Archaic components of other upland sites in the upper Deschutes River Basin (eg., Davis and Scott 1984; Minor and Toepel 1984; Scott 1985a, 1985b; McFarland 1988). McFarland suggests these similarities indicate the upper Deschutes and surrounding mountain flanks were likely favored by transitory hunter-gatherer groups moving between base camps and short-term encampment areas (1989a:137).

McFarland further speculates that patterns gleaned from known sites in the upper Deschutes River Basin point to Late Archaic peoples' bias toward areas close to the river's main channel and feeder drainages where a variety of hunting and collecting activities could be carried out:

> Whether this apparent riverine focus of these Late Prehistoric occupants is an accurate interpretation or merely reflects sampling bias is unknown. Certainly, a number of factors come into play...Despite potential sampling bias, the Late Prehistoric site patterning still seems to be distinctive from the earlier Archaic occupation found in the Deschutes River Basin. That is, much of this Archaic occupation, denoted by the prevalence of what are provisionally termed "Elko" assemblages, appear to be focused away from the river in the pine forest around ice caves and lava flows. Lava Butte (Ice 1962), Mahogany Cave (Scott 1985a), and East Lake (Flenniken 1987), are good examples of heavily occupied sites located deep within the forest away from any dependable water source except water found in ice caves and possibly isolated springs. In contrast, Late Prehistoric sites are highly concentrated around the Deschutes River and its main-stem tributaries (1989a:139-140).

Snyder (1987:29-37), although more-general in her assessment of Cascade uplands use by prehistoric aboriginal groups, agrees with McFarland's conclusions and cites the findings of other investigators (eg., Osborne 1950; Ice 1962; Ross 1963; Cole 1977; Lyman et al. 1983; Minor and Toepel 1983; Hartman 1985; and Scott 1985, 1986) as evidence that small groups of hunter-gatherers briefly occupied and exploited a variety of montane environments for at least 8,000 years. Furthermore, stylistic ties to Columbia Plateau and northern Great Basin cultures are seen intermingled among archaeological assemblages found near the Deschutes River and other points along the Cascades' east slope, indicating that the Cascades probably served as a communal occupation zone for thousands of years.

Contact Period

Although it is reasonable to believe that a number of Late Archaic sites in the central Oregon Cascades were used by Contact-era Native American groups, little corroborating evidence has come to light. Minimal excavation at such sites and scarcity of literature documenting their locations makes the assessment of historic cultural development and its overall influence on native life a very arduous task. Moreover, establishment of links between Euroamerican artifacts and Native

American occupation sites is made nearly impossible if the cultural materials aren't found in buried contexts. Hence, the current dearth of data from the time of Contact virtually assures that this period will remain one of the least understood stages of the region's cultural history.

The influence of the horse on cultural groups occupying the mountains is another aspect of Contact Period history that is still speculative. Assuming that equestrian society had reached the northern Great Basin and Columbia Plateau between the early-1700s and 1830 (Shimkin 1986:517-519), it can be surmised that groups living in or journeying to the Cascades were also familiar with the horse. Whether or how the animals may have been used there has yet to be determined. Nevertheless, the possession of horses could have modified traditional native patterns by offering greater mobility, a larger exploitation territory, a new potential food source and more opportunities for trade and/or contact with neighboring peoples.

Lewis and Clark reported in 1805 that several Columbia Basin groups living near the Dalles had tremendous horse herds, some of which had been captured during assaults on Shoshone camps (Thwaites 1904-1905, 4:76; 280-281). Other Plateau groups used horses to expand trade networks and conduct raids as distant as Klamath territory in south-central Oregon (Spier 1930:39-40). Northern Paiute bands in eastern Oregon are thought to have first obtained the horse sometime between the mid- to late-1700s (Fowler and Liljeblad 1986:455), although related "Snake Indian" groups mentioned by Lewis and Clark (Thwaites 1904-105, 3:147-149) and observed along the Deschutes River in 1826 by Peter Skene Ogden's Hudson's Bay Company expedition party reportedly remained unmounted or had few horses (Ogden 1909-1910:349-350; Fowler and Liljeblad 1986:455).

Unfortunately, no other records from the period of westward Euroamerican expansion indicate the presence and importance of horses or other exotic commodities among native groups frequenting the Cascades. However, the detrimental impact of the horse on traditional native social structures was probably miniscule in comparison to the Contact Period legacies of other, less-tangible Euroamerican imports. The devastation wraught by widespread outbreaks of disease, indiscriminant killings and genocide, competition for land, displacement to less-suitable environments and, ultimately, removal to reservations turned out to be the collective death knoll for most of the indigenous cultures living in all areas of the Pacific Northwest.

Ethnographic Overview

Very little information exists concerning the temporal and spatial distribution of pre-contact native groups which once occupied the central Oregon Cascades. Numerous factors have contributed to this information void, particularly the severe impact of disease on aboriginal populations prior to the arrival of Euroamerican emigrants during the early- to mid-1800s. Epidemics of influenza, measles, smallpox, malaria and other pathogens ravaged native communities, killing up to 90 percent of the people in some areas (Minto 1900:309; Zucker et al. 1983:60). Radical depopulation on such massive and rapid scales undoubtedly had a severe impact on the surviving populations' collective psyches, although to what extent can never be measured. Subsequent shifts in sociopolitical alliances and territorial boundaries likely occurred, resulting in movements and/or possible melding of the surviving populations. Unfortunately, the particulars of such changes have been forever lost to time.

The aquisition of horses by various protohistoric Columbia Plateau and northern Great Basin societies is another factor that muddies our understanding of which (and, to what extent) ethnographic groups may have occupied the east slope of the Cascades through time. As already discussed in previous section, the use of horses would have allowed former-pedestrian folk to move around like never before. Whether or how this may have affected the establishment of territorial boundaries is unknown. Similarly, friction between neighboring groups such as that reported ethnographically among the Tenino and Northern Paiute (Ray 1938:391; 1939:40) further blurs the ability to set distinct cultural boundaries in the uplands. Long-standing conflicts that kept all sides in a constant advance-retreat mode may have been further elaborated by the addition of the horse.

Although most primary sources of information about native life in central Oregon during the historic period come from journal accounts written by early Euroamerican explorers, fur traders, missionaries and settlers, these entries can be problematic. Ethnocentrism and cultural misunderstanding notwithstanding, the few meager passages that do mention aboriginal inhabitants deal almost exclusively with observations of peoples encountered while traveling along the Columbia River or after turning south into the more-fertile territory of the Willamette Valley and southern Oregon. Furthermore, most early emigrants perceived the arid plateau flanking the base of the central Oregon Cascades' east slope as undesireable for trapping or farming and, thus, avoided going into the area.

However, there are a few journal entries that must be considered invaluable because, if for no other reason, they represent the only known first-hand descriptions of early encounters with peoples living in the central Oregon uplands. Examples include accounts recorded between 1825-1829 during the Hudson's Bay Company trapping expeditions led by fur trader Peter Skene Ogden through the Deschutes and John Day River valleys (Ogden 1909-1910; 1950; 1961; 1971). Nathaniel J. Wyeth also detailed a good portion of his journey along the Deschutes River in 1834-1835 (Wyeth 1851; 1899), as did John C. Fremont during his 1843 travels through Deschutes country while enroute to California (Fremont 1846). The report of Lieutenant Henry L. Abbott's railroad route survey from Klamath country down the Deschutes River includes similar tales of meetings with the local residents. Accounts written by other explorers and emigrants during brief passages through the mountains may also exist, but these are too few, far and in-between to be mentioned.

A number of important ethnographic and linguistic studies of native groups that once lived near the Cascades during the historic period were conducted during the early part of the twentieth century. Unfortunately, most of the information about traditional lifeways was gathered from elderly descendants who had spent most of their lives on reservations. Considering that the majority of informants were already far-removed from the age-old customs of their ancestors, much of what they related must be considered second-hand information or possibly not completely representative of practices that took place before the influence of Euroamericans.

Thus, limited information and occasional contradictive viewpoints have generated much debate over the cultural legacies of central Oregon's ethnographic peoples. Nevertheless, some of the most-influential ethnographic compilations can be found in Armitage (1983); Barrett (1910); Baxter (1986:8-18; 42-47); Beckham et al. (1981:41-95); Berreman (1937); Blyth (1938); Coan (1922); Curtis (1911); Gatschet (1877, 1890); Jacobs (1929, 1931, 1937); Loud (1929); Minor et al. (1979:83-208); Mooney (1896); Murdock (1938, 1958; 1965; 1980); Philipek (1982); Ray (1936, 1939, 1942); Ray (1936, 1939, 1942); Ray and Others (1938); Rigsby (1965, 1969; n.d.); Snyder (1989:7-22); Spier (1927,1930); Stern (1966); Steward (1934, 1937, 1938, 1939); Stewart (1937, 1938, 1939, 1941); Suphan (1974); Toepel (1987:7-31); Toepel et al. (1980:26-78); Whiting (1950); and Zakoji (1953).

No archaeological or ethnographic evidence currently available has been able to directly associate any one particular cultural group with the high lakes of central Oregon. A diverse mix of bands may have inhabited or visited these mountainous areas from time to time, including groups from the neighboring Columbia Plateau (eg., Cayuse, Nez Perce, Umatilla), upper Columbia-Willamette River confluence (eg., Clackamas, various Chinookan peoples), Willamette Valley (eg., Kalapuya) and upper Rogue River drainage (eg., Upper Umpqua, Upland Takelma). However, four culturally and linguistically-distinct peoples stand out as the most-likely ethnographic era residents of the high country surrounding Crescent Lake. These include the Molala, Tenino, Northern Paiute and Klamath (Fig. 7).

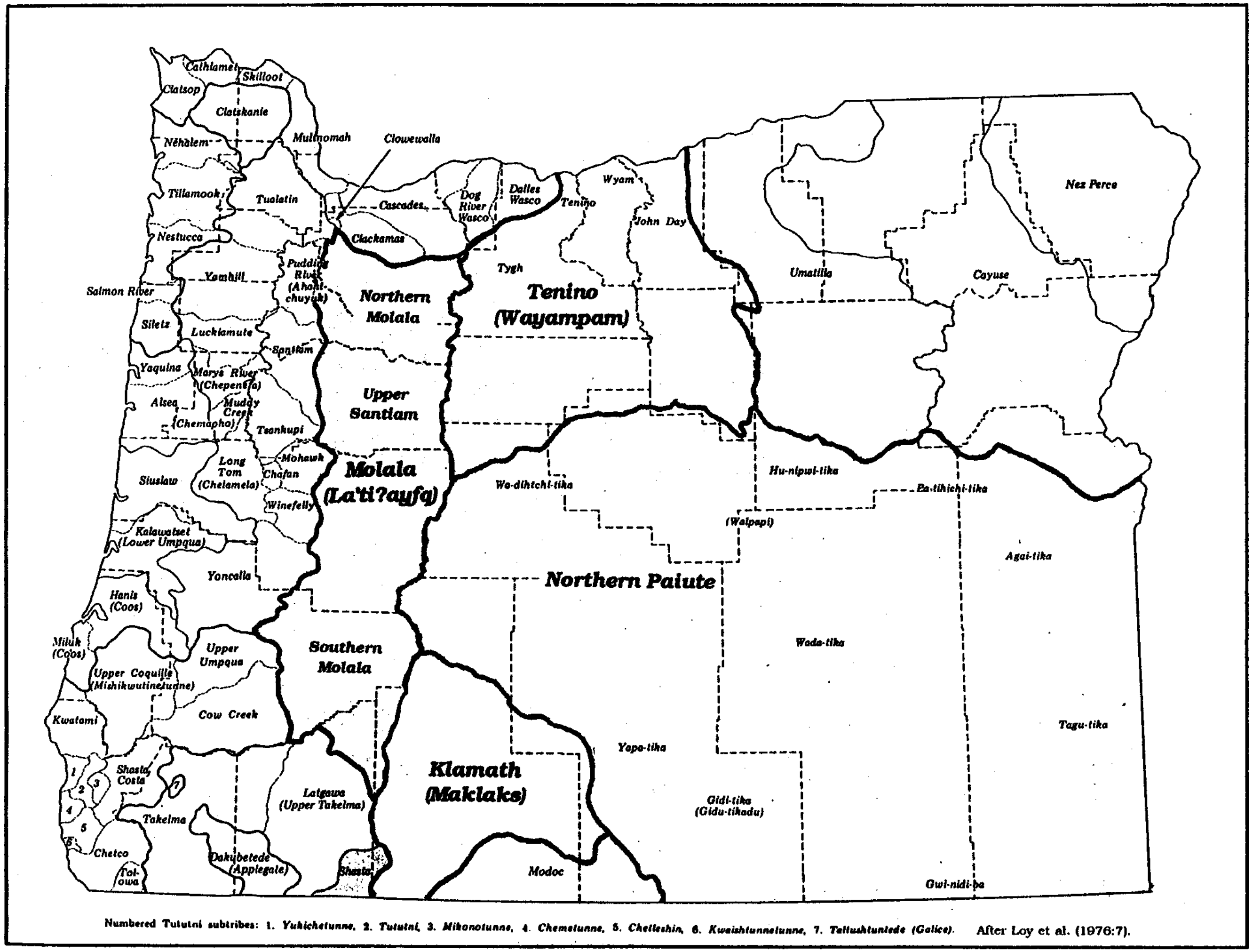

Fig. 7. Generalized distributions of ethnographic Native American territories near the central Oregon Cascades (circa 1850).

La'ti?ayfq (Molala)

In comparison to what is known about the cultural patterns of their neighbors, the Molala remain one of the region's most persistent cultural enigmas. Although most information about these people has been derived from linguistic data and second- or third-hand accounts from other native informants, scattered ethnographic studies have helped to characterize the Molala as hunting and gathering societies focused on the forested highlands and intermountain valleys found on both sides of the Cascade crest. The present consensus suggests that settlement shifts during ethnographic times placed the Molala in an intermediate geographic position between the Kalapuyan speakers of the Willamette Valley, the Sahaptins to the northeast, the Shoshonean-speaking Northern Paiute to the east and Klamath of south-central Oregon.

Still, territorial placement and tenure of the Molala are extremely tenuous subjects that continue to spark relentless scholarly debate. Conflicting documentation concerning native population movements during the nineteenth century continues to shadow the precise whereabouts of Molala populations. The earliest records noting Molala distributions placed them in distinct northern and southern bands near Mount Hood and west of Crater Lake (Coan 1922; Spier 1927; Berreman 1937; Rigsby 1965; Snyder 1987:10). Subsequent references point to Molala territory as being more expansive, characterized by sparsely-distributed groups spread out across the western and eastern slopes of the Cascades between Mount Hood and Mount Scott, part of the present Warm Springs Reservation area and over a large portion of the Deschutes River drainage (Rigsby 1969; MacKey 1972:63; Farmer et al. 1973:14; Beckham 1976).

The Molala referred to themselves as *La'ti?ayfq* (Beckham et al. 1981:85). Unfortunately, this name appears to have been lost to history and replaced by at least 33 alternate name variations and spellings that have been culled from mid- to late-nineteenth century linguistic field notes, official correspondances and ethnographic studies of neighboring peoples (Table 3):

Table 3. Alternate names and spellings for Molala groups. From Hodge (1907:930) and Murdock (1938:397).

Amole'lish (Kalapuya name)	*Molallalas*	*Molelie*
Kúikni (Klamath name)	*Molallales*	*Molell*
Láti-u (Molala name)	*Molalle*	*Mollallas*
La'tiwe (Molala name)	*Molallie*	*Moolal-le*
Malala	*Mo-lay-less*	*Moolalles*
Molala	*Moleaaleys*	*Mooleilis*
Molalallas	*Molealleg*	*Morlal-les*
Molale	*Mole Alley*	*Straight Môlale*
Mo'lalis (Tenino name)	*Moleallies*	*Tai'tilpam* (Tenino name)
Molalla	*Molel*	*Wrole Alley*
Molallah	*Molele*	*Ya'-ide'sta* (Umpqua name)

In 1846, linguist Horatio Hale suggested that the Molala and Waiilatpuan-speaking Cayuse of northeastern Oregon may be related based on similarities between their respective languages (Rigsby 1965:85-87). Although critical evaluation of this and subsequent linguistic information has since refuted such a connection, current evidence suggests the Molala tongue may indeed have ancient linguistic ties to the Columbia Plateau Penutian languages of the Tenino, Umatilla, Nez Perce and Klamath groups east of the Cascades. Consequently, Molala vernacular is now classified as a language isolate of the Penutian language phylum (Rigsby 1965; 1969).

At least two (and possibly three) Molala subgroups are known to have occupied the Cascade uplands during historic times:

(1) Northern Molala:

This subgroup was first described as being centered around the Molala River drainage west of Mount Hood. Hale (1846:214) provides one of the earliest descriptions of the Northern Molala based on information gathered from individuals occupying an area near present-day Oregon City:

> The residence of the Molele is (or was) in broken and wooded country about Mts. Hood and Vancouver (Jefferson). They were never very numerous, and have suffered much of late from various diseases, particularly the ague-fever. In 1841 they numbered but twenty individuals; several deaths took place while we were in the country, and the tribe is probably, at present, nearly or quite extinct.

Barry (1927:60-61) also gives vague mention of Molala populations that occupied three settlements in the Molala River Valley with ranges that spanned between Mount Hood and Mount Jefferson.

(2) Upper Santiam or Santiam Band:

Very little information is available on this population. One sketchy report describes the locations of two settlements at the headwaters of the Santiam River and along the western slope of the Cascades (Swanton 1952:466). This band appears to have occupied a stretch of mountainous country in eastern Linn and Lane Counties between the territories of the northern and southern subgroups.

One of the most intriguing pieces of evidence for the Santiam group's existence is a rough map produced for the Champoeg Treaty of 1851. The drawing indicates that a large portion of land to the north and south of Mount Jefferson along the Cascades' western front was considered the territory of the "Santiam Band of the Moolalle Tribe" (Gibbs and Starling 1851). A separate reservation was to be established for the Santiams to the west of Mount Jefferson and immediately south of a tract reserved for the "Principal Band of the Moolalle Tribe". Unfortunately, the United States never ratified the treaty and the reservations were never established. The subsequent Dayton Treaty of 1855 relinquished all Molala claims to the land, and no distinction was given to the existence of the Santiam band.

(3) Southern Molala:

Described by one Northern Molala informant in the early-1900s as a people who spoke a similar language "but named everything different", the Southern Molala ranged the Cascade uplands of Douglas County to the west of Klamath Lake (Rigsby 1965:72-74). Joel Palmer, first U.S. Indian Agent for the Willamette Valley, offered his initial impressions of the Southern Molala after passing through southern Oregon in 1853:

> While on my late expedition I came to the knowledge of the existence of a tribe of Indians inhabiting the country on the upper waters of the North and South Forks of the Umpqua and the headwaters of the Rogue River called the wild Mo-lal-la-las. The name so nearly resembles that of the Mol-al-las of the Willamette that they have been confounded with that tribe; but the information that I have obtained satisfies me that they are a distinct tribe, speaking an entirely different language and having no connection whatever with them...They have but little intercourse with the whites, being located in a remote and mountainous region off the line of travel from Oregon to California. They roam sometimes as far east and southeast as the headwaters of the Des Chutes and the Klamath Lake (Coan 1922:34).

Despite Palmer's original notion that the Southern Molala were unrelated to their northern neighbors, later ethnographic and linguistic studies (eg., Gatschet 1877:165; Spier 1927; Rigsby 1965) have helped to establish a link with the other Molala populations. Spier's (1927:360-361) interviews with residents of the Klamath Reservation have helped to further elaborate on the Northern-Southern Molala cultural connection:

> Rogue River above the Walumskni [Upper Takelma] was occupied by the Molala according to the same informants. These lived along the creeks of this high ridge country down to the canyon, that is to a little below Prospect or even as far as Trail Creek. The position of these Molala on the high ridge is so anomalous for an Indian group as to be suspected were it not that we have early confirming authority [i.e., Joel Palmer]. Nevertheless these are Molala, whose descendants still live among the Klamath of the lakes (Spier 1927:360-361).

Albert Gatschet's late-nineteenth century studies of native groups living in western and southern Oregon also contain valuable ethnographic descriptions of the Southern Molala:

> A few families of hunting Molale Indians, congeners of the "Old Kayuse" Indians near Yumatilla River, were formerly settled at Flounce Rock, on the headwaters of Rogue River, and farther north in the Cascade range.

> The Klamath Indians were filled with hatred against them; they were by them called Tchaka'nkni, inhabitants of Tchakxe'ni, or the "service berry tract," and ridiculed on account of their peculiar, incorrect use of the Klamath language. In former times Molale Indians held all the northeastern slopes of the Willamet Valley, claiming possession of the hunting grounds; the bottom lands they left in the hands of the peaceably disposed, autochthonic race of the Kalapuya tribes, whom they call Mokai or Moke (Gatschet 1890:xxxvi).

Teit (1928) and Berreman (1937) have proposed similiar theories suggesting the Molala initially occupied the eastern flanks of the Cascades along the Deschutes River as well as the present-day Warm Springs area. Berreman (1937:44-46) further speculates that the Molala initially fanned out along the mountainous east slope as far south as Klamath Lake, but were pushed westward over the Cascade crest sometime during the early historic period by Northern Paiute invasions. The scattered nature of the Molala populations would have allowed their antagonists to easily drive a wedge into their ranks and split them into the northern and southern subgroups recognized during the mid-1800s.

Murdock (1938:397-398; 1980:130) offered a comparable east-side origin theory with the contention that the Molala originally maintained a winter village in the Tygh Valley along the lower Deschutes River at the beginning of the nineteenth century. During the warmer months, the Molala moved to the prime fishing grounds near modern Sherar's Bridge and made seasonal journeys into the eastern Cascade uplands. Then, sometime during the spring shortly before 1830, a Tenino group attacked the Molala and drove them westward across the Cascade crest. The invaders relished the spoils of victory by settling into the Molala's prime hunting, gathering and fishing territories, and eventually became known as the Tygh Tenino group.

Although the evidence supportive of a forced westward migration during the early historic period remains circumstantial, proponents have argued that proof can be found in the oral histories of peoples living on both sides of the mountains. Tenino informants at the Warm Springs Reservation insisted that the Molala didn't move across the Cascades until being driven away by their more numerous ancestors sometime during the early-1800s (Murdock 1938:398). To the west, ethnographic accounts related by the Clackamas and Santiam Kalapuya speak of being forced out of their respective territories by the westward-advancing Molala (Gatschet 1877:167, 256).

More-recent analyses of the available ethnohistorical and ethnographic literature have led Rigsby (1965; 1969:80-82) to refute the entire recent migration concept as baseless speculation. Adding that numerous interviews with elderly Sahaptin informants at the Warm Springs Reservation gave no indication of a "recent" Tenino movement into the Tygh Valley, conflicts with the Molala nor a mass westward exodus, Rigsby concludes there is little evidence to support the theory that the Molala migrated from the east side of the Cascades during the early nineteenth century. Rather, scattered Molala groups have probably occupied the Cascades' upper west slope from the Clackamas River/Mount Hood area down to the upper Rogue River for a much longer period. Moreover, while a much earlier westward shift is still probable, occasional forays back across the Cascade crest may have continued to take place well into the 1800s.

Little is known about the Molala seasonal round. Yet, Baxter (1986:47) has proposed a Molala land use "model" based on information gleaned from the limited ethnographic data base and patterns extrapolated from the neighboring Kalapuya. Entire bands apparently congregated at permanent winter village sites located at lower elevations along streams where anadromous fish runs could be exploited. Small family groups are believed to have occupied underground houses similar to the semi-subterranean structures used by Klamath and Columbia Plateau peoples (Rigsby 1969:80; n.d.:2). To date, winter village sites have only been documented on the west side of the Cascades.

During the spring, villages were abandoned as nuclear family groups moved toward base camps in the various drainages, savannas and meadow areas of the higher country. Groups traveling through the highlands followed and capitalized on the seasonal appearance of roots, berries and game (eg., deer, elk, bear). Salmon, steelhead, trout, eels and other aquatic resources from lakes and streams were also garnered as supplements to the Molala diet. Observations made by Joel Palmer in 1853 note that Molala

> subsistence is chiefly wild game with which their country abounds, while numerous mountain streams and lakes afford a rich supply of fish. Some of these lakes are said to be twenty miles in length, with considerable margins of fertile land, and surrounded with precipitous mountains (Coan 1922:34).

Hunting appears to have been the Molala's primary year-round subsistence activity. Most animals are thought to have been taken with bows, while lesser amounts were probably captured by snares and deadfall traps (Spier 1930:158-159; Stern 1966:14). Small, short-legged hunting dogs were also used to track and drive game toward hunters (Spier 1930:158; Rigsby 1969:101). As fall approached, Molala attentions shifted toward the organization of group hunts and plant gathering in the lower elevations. Acorn, hazelnut, grass seed and berry harvesting became particularly important. Base camps were probably still occupied until the arrival of major rains in the late fall, after which the Molala headed back to their winter villages.

An encounter between Molala individuals and an emigrant group led by Joseph M. Garrison in early July, 1853 near present-day Lookout Point Reservoir on the Middle Fork of the Willamette River hints at what Molala life may have been like during early historic times:

> At Demijohn's Tower, so called because it resembled this antique glass vessel for liquor, the Garrison party met the first Indians they had seen on the Middle Fork -- one lodge of Molallas, four men, one woman, and three children. The agent recorded that these Indians told them "that there were about twenty Molala and Klamaths, who have united and married and are in this vicinity. They say they live in the valley in the winter, but in the summer stay in the mountains" (Menefee and Tiller 1977a:55).

The Molala maintained good relations with most of their neighbors. They were known to frequently intermarry, trade and forge alliances with the Chinookan peoples, Kalapuya, Klamath, Modoc, Tenino and various other Sahaptin bands (Menefee and Tiller 1976, 1978; Stern 1966:19; Zakoji 1953:9). Strong affiliations were especially important to those groups who traveled into neighboring territories during trading and subsistence-related activities. Relations with the Northern Paiute, however, were not so friendly. Mutual hostility raged between the two groups, and contact appears to have taken place primarily during slave-capturing raids (Murdock 1938:397).

Slavery appears to have played a part in Molala society, although the extent to which is unclear. Some ethnographic reports indicate that slaves were captured during assaults on Kalapuya camps, aquired through trade near Oregon City or bought from the Klamath (Jacobs et al. 1945:41; Beckham et al 1981:93). Conversely, the Molala were targets of slave raids waged by the Cayuse and Nez Perce during the early historic period (Rigsby 1965:240).

Molala bands maintained particularly close ties to the Klamath people of south-central Oregon. Groups were known to meet during the fall near Crater Lake and Klamath Basin for communal berry harvests, joint hunting, arranged marriages and socializing (Spier 1930:9, 41; Zakoji 1953:11; Stern 1966:14, 18). These annual gatherings also allowed the Molala to trade buckskins and elk antler spoons for wokas (pond lily seeds), beads and other coveted Klamath goods. The strong military alliance linking the two peoples was especially important in helping to stave off attacks by common enemies such as the Northern Paiute.

Most Molala groups were also on generally good terms with Euroamerican emigrants. However, the relationship became strained when a few individuals joined a mixed band of Umpqua, Takelma, Pit River (Achomawi and Atsugewi), Modoc and Klamath in an uprising that became known as the Molala War of 1847-1848. Originally planned to be part of a more-massive assault on the settlements of the Willamette Valley, the uprising was quickly crushed by an army of whites and sympathic Indians who mounted a sneak attack and massacred a large number of the insurgents (Bancroft 1886:746-751; Clark 1927:550-552; Stern 1956:238-239).

No accurate count of Molala populations has ever been tallied. Years of decimation by Euroamerican-borne diseases likely razed Molala groups to such a point that only scattered remnants remained when white emigrants began the rush to settle both sides of the Cascades during the mid-1800s. The aborted Champoeg Treaty of 1851 listed 58 individuals from the northern or "Principal Band" and 65 for the "Santiam Band" (Mackey 1974:125). No mention was given to Southern Molala populations. Most survivors were later removed to the Grand Ronde Reservation in western Oregon after signing the Dayton Treaty of 1855. By 1891, only 31 Molala descendants were reported at the Grand Ronde Reservation, while a few straglers still lived in the mountains west of Klamath Lake (Powell 1891:128). Molala society is now considered to be culturally extinct.

Wayampam (Tenino)

The Tenino led a fairly sedentary life in comparison to other native groups who made use of the Cascades. Known ethnohistorically for their focus on the abundant fisheries of the middle Columbia River and its tributaries, these Sahaptin-speaking bands were also dependent on plants and game obtained during seasonal journeys along the eastern flanks of the central Oregon Cascades. From their villages along the south shore of the Columbia River, the Tenino were bound on the west and north by the territories of the Upper Chinook (eg., Wasco, Wishram, other Sahaptin peoples), Umatilla on the east, the Cascade-dwelling Molala to the west and south and due south by Northern Paiute bands of the High Lava Plains (Murdock 1980:129).

The Tenino were composed of four local groups who each spoke a closely-related Columbia River Sahaptin dialect of the Penutian language phylum, similar to the languages of the Nez Perce, Cayuse, Umatilla, Wasco, Molala and Klamath-Modoc

(Rigsby 1965:48). Although each group maintained a close interrelationship with the others, affiliations were kept loose and changes from one to another were not uncommon. Each local group typically occupied an interior winter village and a spring-summer fishing village on the Columbia River or nearby tributary. Moreover, it was not unusual for a few individuals of a given group to occupy a smaller secondary site during one of the seasons (Murdock 1980:129).

The four local Tenino groups include:

(1) Dalles Tenino:

This group occupied two summer villages at Five Mile Rapids on the south bank of the Columbia River and one winter camp five miles to the south on Eightmile Creek (Rigsby 1965;55-57; Murdock 1980:129-130). The Tenino name is derived from the Sahaptin term "*Tinainu*" (or "*Tináynu*"), the native name for the larger of the two summer settlements.

(2) Tygh:

An early offshoot from the Dalles Tenino, this group is difficult to track due to the erratic movements of people through the region during the nineteenth century (Rigsby 1965:57; Murdock 1980:130). After gaining control of Molala territory along the Deschutes River shortly before 1830, several small bands maintained a summer fishing village at modern Sherar's Bridge on the Deschutes River and possibly two or more winter villages in the Tygh Valley. Rigsby (1969:81-82) adds that Sahaptin informants from the Warm Springs Reservation described their ancestral territorial use in this area as extending southward along the east slope of the Cascades as far as Crane Prairie and La Pine, with possible ventures stretching down to the northern fringe of Klamath country.

(3) Wayam or Deschutes:

This group lived at the summer village of "*Wayám*" at Celilo Falls on the Columbia River and wintered at "*Wanwa'wi*" on the western shore of the Deschutes River immediately south of the confluence with the Columbia (Rigsby 1965:54;

Murdock 1980:130). The summer settlement also served as a major trading hub for peoples visiting from every direction.

(4) John Day or Tukspush:

The John Day people had several summer fishing villages south of the Columbia River along the lower John Day River, and two winter sites near the confluence of both drainages (Rigsby 1965:53; Murdock 1980:130). In addition to traveling northwest into the Washington Cascades to hunt and gather, John Day groups would frequently trek eastward during the fall to trade with neighboring Umatilla bands.

The subsistence economy and land use practices of the Tenino remained somewhat of a mystery until the mid-1930s when Murdock (1938, 1958, 1980) began to publish his ethnographic findings gathered during interviews with Tenino informants at the Warm Springs Reservation during the summers of 1934 and 1935. Ray's (1936, 1939, 1942) subsequent integration of Murdock's data into the context of Southern Plateau cultural development further helped to reveal a picture of a people who were reliant not only on the anadromous fish runs of the Columbia River, but also on seasonal movements in and around the Cascade uplands:

> Prior to the reservation period the Tenino lived a semi-nomadic life, practicing no agriculture and possessing no domestic animals except dogs and at a later date a modest number of horses. They subsisted primarily by fishing but to an important extent also by hunting and gathering. The men hunted and did most of the fishing. The women dried the meat, smoked the fish, and did most of the gathering, although the men helped in collecting acorns and pine nuts and to a lesser extent in picking berries. The women conducted most of the trade with visitors from other tribes, the men confining themselves chiefly to the exchange of horses and an occasional distant trading expedition.
>
> In their winter villages each family unit had two houses -- an elliptical, semi-subterranean, earth-covered lodge used for sleeping and a rectangular frame dwelling with walls and a gable roof of tule mats used for cooking and daytime activities. Winter pursuits included hunting and trapping, stream fishing, fuel gathering, and the manufacture of artifacts. In late March the Tenino dismantled their winter dwellings and removed to their summer villages. Here each family group erected a rectangular shed of poles and mats with a flat roof, of which half was used as living quarters and the other half for drying salmon.

> In early April special parties were dispatched to gather roots and catch salmon for an important first-fruits ceremony. Except for the John Day, who celebrated separately, the entire tribe assembled at a Dalles Tenino village. After this festival about half the families of a village departed for a series of expeditions toward the south; they lived for several days at a time in temporary camps of mat-covered tipis while the women gathered roots and the men hunted. The rest of the population remained in the summer village, catching and drying salmon. In July the entire population returned to the summer villages for another first-fruits ceremony, this one featuring the berries and venison ritually obtained by a special party of six men and six women.
>
> Following the summer festival the people again divided, part remaining in the villages to continue salmon fishing and to trade while the rest went to the Cascade Mountains to gather berries and nuts and to hunt. In September, at the conclusion of the berry season, hunting parties set out on long expeditions up the Deschutes and John Day rivers. The women smoked the meat obtained by the men and gathered late-ripening roots and berries. In October a special party collected tule reeds for mats. The drying sheds were now dismantled, and the people removed to their winter villages, reconditioning and occupying the dwellings there (Murdock 1980:131-132).

Although it is clear that the annual appearance of salmon on the Columbia River and adjacent drainages dictated the economic round of the Tenino, expeditions into nearby uplands were occasionally made in pursuit of elk, several deer species, antelope, mountain sheep, bear, grouse and waterfowl. However, hunting was considered a less-important activity because a large proportion of meat, hides, antler and bone items could be gained through trade. The search for plant foods, on the other hand, took a prominent place in the Tenino subsistence cycle:

> Of the roots, camas and kouse were undoubtedly the most important; the former was gathered in the moist upland meadows and prairies primarily in the spring of the year, while kouse was found along open hill sides in dry rocky soil during April and May. These -- as well as other roots such as lupine, wild onions, and wild carrots -- were either eaten raw or prepared in various manners. Among the numerous berries to be found along the mountain slopes and river courses in fall huckleberries, blackberries, chokeberries, and cranberries were perhaps among the most prevalent. Hazel nuts and acorns, as well as a moss used as a condiment, were also gathered in the forests in fall (Suphan 1980:22-23).

The Tenino's primary upland subsistence zone extended into the Cascades between Mount Hood and Mount Jefferson (Suphan 1974:76). By the protohistoric period, hunting parties were known to frequently penetrate further south into what they considered Northern Paiute country around the Metolius River, Green Ridge, Black Butte and Three Sisters area. The aquisition of horses and guns shortly after 1800 allowed Tenino groups to intensify their expansion into the upper Deschutes drainage (Mooney 1896:742). After forcing the Molala westward during the early-nineteenth century, the Tenino continued their encroachment southward into their age-old enemy's homeland:

> Gradually, in part through slave raids but mainly through the ruthless extermination of Paiute groups encountered on hunting expeditions, the Tenino advanced ever deeper into the territory of their traditional foes. By the time of the establishment of the Warmsprings Reservation they had expelled the Paiute from the berrying grounds near Ollalie Butte and Mt. Jefferson, from the wintering places at Hot Springs, Warmsprings, and siksi'kwi, from the root-gathering grounds around Shaniko, and from the entire John Day Valley almost as far south as the great bend of that river. Hunting expeditions ranged still deeper into Paiute territory (Murdock 1938:398-399).

In addition to their seasonal round of fishing, hunting and gathering, the Tenino were active participants in the intertribal trade network that flourished at their own, Wasco and Wishram villages centered around the Dalles on the Columbia River (Murdock 1980:132). The trade complex extended westward to the Pacific Ocean, eastward to the edge of the High Plains, north into the heart of the Southern Plateau and south as far as northeastern California and southern Oregon. Traders from every direction eager to barter or gamble away their goods would descend upon the Dalles settlements during the summer, particularly after the salmon season began to wind down.

Tenino wares contributed to the trade rendezvous primarily included dried salmon, fish oil, furs and items obtained from other groups (Suphan 1974:24-25; Murdock 1980:132). In exchange, they could expect to get dentalia, wappato and shell goods from the coast, coiled basketry from the north, horses, buffalo hides and meat from the Plains and basketry, beads, slaves, eagle feathers, elk skins and Pit River bows from the south. The vastness of the trade industry helped to cement good relations between most participating groups, a benefit exemplified by the Tenino's complete freedom to trade and venture into the territories of the Wasco, Wishram, Umatilla and other Washington Sahaptin groups.

Slavery was another aspect of the regional trade network that Tenino groups participated in (Murdock 1980:143). Slaves were either captured during ongoing warfare with the Northern Paiute or bought from the Klamath. Although most slaves held by the Tenino were eventually passed on through the slave trade, some were kept to help out with household chores. Children who grew up as slaves commonly aquired their freedom by eventually marrying into their Tenino group.

The Tenino had a fairly rich material culture. Based on the extensive list of items assembled by Ray (1942:140-164), Toepel et al. (1980:39) have prepared a brief inventory of the varied Tenino tool kit:

> Utensils and dishes included twined willow baskets which were sometimes covered with pitch to hold water, twined cedar bark or rush baskets, mountain-sheep horn cups and spoons, wooden spoons and spatulas, clamshell spoons, wooden bowls, folded cedar-bark bowls, wooden and stone mortars, and stone pestles. Implements used in subsistence activities included a variety of wooden, horn and bone digging sticks, horn wedges, chisels, stone and wood pile drivers, one-piece horn drills, obsidian knives, and horn and fishbone awls. Other items were flat, U-shaped, twined sifters; sewed rush baskets; skin carrying bags; rush and bark matting; a variety of fibers and cords; and raccoon and rabbitskin blankets. Weapons included three-foot self bows with sinew bowstrings, arrows with obsidian and bone points, wooden clubs, and rawhide shields. For water transport, the Tenino utilized dugout canoes and log rafts.

On June 25, 1855, Tenino representatives signed the Middle Oregon Treaty with the United States (Murdock 1980:130; Zucker et al 1983:87-88, 97-99). Most Tenino peoples were removed to the Warm Springs Reservation in 1857, and then joined by Wasco and Chinookan groups a year later. By 1859, official population counts tallied 850 Tenino living on the reservation, while 60 Wayam and 100 John Day individuals still remained on the outside. The federal government attempted to impose a farming and herding lifestyle on the reservation natives, but the transition was never fully successful. Although subsistence farming and livestock raising were eventually incorporated to a certain extent, traditional food gathering methods remained an important part of the Warm Springs peoples' lives.

The establishment of the reservation infuriated the neighboring Northern Paiute, however, because much of the land that it encompassed had been recently lost to the Tenino. Enraged that their longtime foes were being settled on territory that was considered part of their traditional homeland, the Northern Paiute lashed out against the scattered reservation homesteads with an almost constant barrage of mounted raids that continued for a number of years (Murdock 1938:399-400). Horses were stolen, livestock herds were plundered and murderous attacks took place well into the 1860s. Tensions between the Warm Springs groups and Northern Paiute began to settle somewhat by the 1880s, enough so that a small number of Northern Paiute were later placed on the reservation (Zucker et al 1983:97).

Northern Paiute

The Northern Paiute were semi-nomadic, hunter-gatherers who managed to forge a prosperous life in the many harsh environments of the vast Great Basin. During the early days of Euroamerican contact, Northern Paiute bands occupied an extensive portion of the basin and range territory that stretches across Oregon, Idaho, Nevada and California. Paiute country within Oregon was centered in the arid central and southeastern high desert, with fringing areas extending toward the eastern slope of the Cascades and Columbia Plateau near the upper reaches of the Deschutes and John Day Rivers. According to Stewart (1939:144), the full extent of Northern Paiute territory was determined by geographic parameters:

> The total Northern Paiute territory, shaped roughly like an isosceles triangle with a 275-mile base at Blue Mountains, Oregon, and with 600-mile sides reaching to a point at Owens Lake, California, contains approximately 78,000 square miles of the near desert land of the Basin and Range physiographic province of western United States. The western boundary conforms closely with the edge of the Great Basin, although the Paiute did not exclusively occupy the slopes of the Sierra Nevada and the Cascade mountains. The northern boundary, technically beyond the edge of the interior basin because it includes streams draining to the ocean, is, nonetheless, coincident with the desert sagebrush vegetation zone boundary, for the volcanic plateau which extends into the northern end of the Great Basin has modified the physiographic scene more than it has the vegetation. Consequently, we may assume that Blue Mountains, the northern edge of the Great Basin flora, is the real edge of the Basin. Since both early explorers and my informants considered Blue Mountains the northern boundary of Oregon Snake (Paiute), we can say that the northern and western boundaries of the Northern Paiute tribe coincide with geographic boundaries. The eastern boundary between the Paiute and the Shoshoni, both within the Great Basin, does not agree with any geographic boundary.

The Northern Paiute are believed to be descendants of a larger group of Numic-speaking peoples who migrated northward from the arid Death Valley-Southern California region approximately 1,000 years ago (Lamb 1958; Hopkins 1965; Goss 1968). Glottochronological evidence and close linguistic ties between the northern Numic languages and dialects suggest that early Numic speakers separated from their Uto-Aztecan language family relatives and dispersed outward across the Great Basin (Miller 1986). The Numic advance into the region can be traced archaeologically by the appearance of small, triangular Desert Side-Notched and Cottonwood projectile point styles (Bettinger and Baumhoff 1982:490). What drove the Northern Paiute ancestors to move northward, however, is still debateable (Bettinger and Baumhoff 1982; Simms 1983),

A particularly strong case has been made for a climatic drying trend around the same period which may have given Great Basin populations accustomed to lacustrine and lake environments reason to seek out better-watered peripheral areas (Pettigrew 1985; Aikens and Witherspoon 1986). Having already been long-adapted to life in arid environments, the Numic peoples simply seized the opportunity to expand into similar territory that was now being abandoned by its previous occupants. Although this explanation is still conjectural, a postulated late appearance by the Northern Paiute and their Numic-speaking relatives in the Great Basin may be key to determining the identity of earlier peoples who frequented the east slope of Oregon's Cascade Range.

The Northern Paiute had no concept of "bands" in a political unity or territorial division sense. Rather, sociopolitical organization consisted of family groups who occupied the same general area (Steward 1939:261). Political control within the band group was kept to a minimum, membership was fluid and families were free to move from one group to another whenever they so desired. The constant state of flux in both band membership and range meant that well-defined territorial boundaries did not exist between neighboring groups.

Steward (1939:262) suggests that natural markers or distinctive elements within a band's territorial environment dictated the identity of each group. Of the 21 Northern Paiute bands that Steward has identified, most were named after local food sources or prominent geographical landmarks. This naturocentric nomenclature has invariably caused ethnographers and historians attempting to identify individual bands and territorial boundaries to come up with conflicting information. Such is the case with discrepancies between group distributions proposed by Stewart (1939:126) and Blyth (1938:396). Reasons for these inconsistencies may include (1) that bands may have been addressed by more than one name by their neighbors; (2) several bands may have been called by the same name; (3) the lack of distinct territorial boundaries; and (4) individual bands lacked social and political autonomy. Steward (1939:262) concludes that these factors will forever inhibit the construction of an accurate map showing the distribution of most Northern Paiute groups.

Based on studies conducted by Blyth, Steward and Stewart, three Northern Paiute bands may have occasionally ventured into or occupied portions of the eastern flanks of the central Oregon Cascades:

(1) Hunipuitöka, Walpapi or Hu'nipwi'tïka:

This band's name has been variably interpreted as meaning "*Eaters of Lomatium Roots*" (Stewart 1939) or "*Root Eaters*" (Blyth 1938:403). Stern (1966:288) also notes that "Walpapi" is derived from the Klamath word "*walpapis*", a translation for the Paiute term "*hunipuitöka*". Hunipuitöka territory extended northward from Twin Buttes in Deschutes County to where the Wasco County line crosses Highway 97, east to the John Day River and up its North Fork to the Blue Mountains, south along the crest of the Blues to the head of the Malheur River, and then southwest back to Twins Butte (Stewart 1939:131). Blyth (1938:403) places the group's winter sites near Canyon City Creek, John Day and the John Day Valley.

(2) Wa'dïhïchi'tïka:

The "*Juniper-Deer Eaters*" (Blyth 1938:403) are believed to have ranged from west-to-east between Mount Jefferson and Prineville, and north-to-south between Gateway and Bend. Some band members traditionally wintered in the Bend area and along the northern bank of the Metolius River.

(3) Yapa'tïka, Goya'tïka or Yahushkin:

Members of this band have been referred to as "*Yapa Eaters*" (Blyth 1938:403), "*Crawfish Eaters*" (Blyth 1938:403; Stewart 1939) or "*Yahushkin*" (Stewart 1938:406, Fig.3). This band was centered in Lake County near Paisley and had a range that extended between Silver, Summer and Abert Lakes. Journeys were also made as far north as the Paulina Mountains, overlapping the southerly range of the Juniper-Deer Eaters.

Although band divisions were often vague and indefinite, the Northern Paiute considered themselves to be one people. All bands spoke mutually intelligible dialects, shared the same semi-nomadic lifestyle and made a sharp distinction between themselves and their Penutian and Shoshone neighbors. However, early Euroamerican explorers and settlers were not so discriminating between native groups, as shown by the common use of the name "*Snake*" to refer to all Great Basin dwellers, especially when speaking of the Northern and Southern Paiute, Mono, Shoshone and Ute.

"*Bannock*" was another Euroamerican name used to collectively apply to Northern Paiute and Shoshone groups of the Great Basin. Furthermore, "*Paviotso*" and "*Digger Indians*" were additional terms applied when distinguishing between the two tribes, respectively (Toepel et al. 1980:63). The name "*Paiute*" is itself an amalgamation of the native "*pa*" ("water") and "*ute*" ("direction"). Nevertheless, the Northern Paiute preferred the term "*nomo*" ("people") (Stewart 1939:127).

The traditional view of the Northern Paiute and other Numic groups as indigent peoples needing to constantly wander the desert landscape in order to maintain a minimal existence is being challanged by the recognition that these Great Basin populations successfully exploited a broad range of environments. As noted by Snyder (1986:16-17), the Northern Paiute flourished by focusing on a continuum of settings that ranged from the semi-arid to xeric:

> As is true of other hunting and gathering cultures, the underlying subsistence strategy involves exploitation of diverse resources, some of which may only be seasonally available or in limited quantities. Where available, more dependable, concentrated resources may significantly alter the stereotypic "nomadic" Great Basin lifestyle (cf. Fowler and Liljeblad 1986; Moratto 1984:291; Thomas 1973). Thus, it is not without precedent that Northern Paiute should harvest plants, fish, and game from environments around the edge of the physiographic Great Basin boundaries, including those found on the Cascades' east slope.

Ethnographic information suggests the Northern Paiute practiced a rest-rotation land use strategy (Atwell et al. 1994:3-2, 3). Based on the five-part prehistoric subsistence-settlement scheme proposed by Schalk et al. (1994), Northern Paiute bands appear to have regularly adjusted their seasonal round to avoid over-exploitation and optimize food resource yields. Although their strategy was more-akin to classic foraging rather than a semi-sedentary collecting pattern (eg., whereby annual seasonal ranges would have been repeatedly exploited rather than rested), their practice of storing seeds, fish, meat and berry caches for winter use (Fowler and

Liljeblad 1986:441-443) indicates they didn't follow a strictly-foraging pattern. Atwell et al. (1994:3-3) further speculate that rest-rotation, foraging and semi-sedentary collecting strategies may have been practiced by residents of the Great Basin prior to the arrival of the Northern Paiute.

During the summer months, Northern Paiute bands moved into the uplands to take advantage of the plentiful seasonal bloom. The summer harvest yielded many grass seeds such as common fescue, wheat grass, Indian rice grass, bluegrass, cattail, rushes and sunflowers (Toepel et al. 1980:69). By late summer, edible roots, bulbs and berries were gathered near lakes, streams and other fresh water sources. Winter reserves were stocked with an opulent assortment of edible plants, including wild onion, arrowroot, camas, bitterroot, cattail root, juniper roots, tiger lily bulbs, tule, Ponderosa pine nuts, manzanita and mountain mahogany. Serviceberries, gooseberries, squaw currant, huckleberries and raspberries were also welcome additions to winter food caches.

Precontact communities usually consisted of clusters of individual families that congregated seasonally at a *tebiwa* (home tract or district) (Fowler and Liljeblad 1986:436). During the summer foraging months, small family bands would splinter away from the tebiwa and into their territorial hunting and gathering districts. While living in the upland foraging areas, Northern Paiute families stayed in temporary brush windbreak shelters built on the ground (Stewart 1941:377-379). As late summer began to fade into the early autumn months, greater emphasis was placed on hunting. Deer, elk, grouse, waterfowl, various small game animals, fish and insects became increasingly important supplements to the Northern Paiute diet.

By late November, most band members had begun returning to their lowland winter village sites in areas close to reliable water sources. Winter dwellings typically took the form of circular, domed wickiups framed by bent willows. These structures ranged from six-to-eight feet high, eight-to-fourteen feet in diameter and were blanketed with grass, tule, brush or mat coverings. Tipi-like tripod constructions were also common, although the style used depended on the needs and desires of the group (Stewart 1941:377-379).

Northern Paiute bands centered their tebiwas in core locations where food supplies were moderately abundant.

> The extensive, sterile, dry stretches surrounding the productive spots were not necessarily recognized as belonging to a certain band. Rather, several bands may have made mutual use of the more barren areas. However, bands did recognize possession of certain productive tracts such as lakes, streams or hunting grounds which they established primarily through regular use. Other bands were free to hunt and gather in those areas, but they always did so with the understanding that they were visitors (Toepel et al. 1980:68).

Tool kits were kept to a minimum to help maintain their mobile lifestyle. Many implements were fashioned on the spot from natural objects and organic materials and then discarded when the task at hand was completed. Typical tools used to process and procure foods included stone manos and metates, hopper mortars, lithic knives, arrow points, scrapers and cutting instruments made from local and exotic obsidian and chert, bone awls, hammerstones, abraders and an assortment of wooden implements. Willows, tule and fiberous plants were used to make snares, nets, traps, corrals, seed beaters, bottles and woven baskets. Shredded sagebrush bark was also sought for weaving into blankets, sandals and bags (Stewart 1941; Fowler and Liljeblad 1986:439-443).

Life for the Northern Paiute was forever changed with the coming of the nineteenth century. By far, the foremost influence for cultural change was the arrival and wide-ranging after-effects of Euroamerican contact. Historical documentation of life among the Northern Paiute bands of central and south-central Oregon during this period is extremely limited, but it can be assumed that changes roughly paralleled what was happening to their relatives to the east (cf., Wheeler-Voegelin 1955-56; Steward and Voegelin 1974; Fowler and Liljeblad 1986:455-457).

The impact of the mass migration along the Oregon and California Trails undoubtedly played a destabilizing role in the lives of central Oregon's native peoples. Destruction of traditional resources and landscapes coupled with increasing hostilites between emigrants and Great Basin groups living near the wagon routes likely had a rebound effect on those bands living in the interior. Northern Paiute groups under pressure from the advancing Euroamericans often reacted by withdrawing from their home territories and fleeing to Oregon (Fowler and Liljeblad 1986:456), thereby increasing tensions and resource competition among populations already there. Unfortunately, these repercussions have never been fully explored by historians and ethnographers.

Although the Northern Paiute were traditionally considered a peaceful people, a number of ethnographic reports suggest they shared plenty of bad blood with the Tenino. The ebb-and-flow nature of their relationship is described by Ray (1938:391):

> Neither side ever attempted to wrest *territory* from the other. Marauding parties carried away moveable property, but the main object of warfare was the attainment of glory. A man's principal opportunity to raise his status was through valor in warfare...In these contests the Shoshoneans often pushed as far north as the Columbia River,...but the invaders never remained long and in no case established permanent camps. Any attempt would doubtless have resulted in failure, for the balance of power was at all times very even and the Sahaptins were on home ground.

Meetings between the two always took place on foot until around 1800 when the Tenino began acquiring guns and horses through the Columbia River trade network. The Sahaptins quickly gained a strategic advantage over their unmounted foes and began to gradually press southward into Northern Paiute territory. The area around present-day Warm Springs eventually fell into Tenino hands and the Northern Paiute were forced to retreat even further south. It wasn't until the mid-1800s after the establishment of the Warm Springs Reservation that neighboring Northern Paiute groups were capable of exacting an effective revenge on the Tenino.

Unlike some of their eastern Oregon and northern Nevada relatives who began developing fully-mounted "bands" as early as the turn of the century, most Northern Paiutes in central Oregon retained their traditional pedestrian economies well into the 1840s (Fowler and Liljeblad 1986:455-456). A marked increase in horse use and the rise of mounted raiding parties occurred during the late-1840s and 1850s, not surprisingly coincident with the rapid tide of emigrants flowing through Northern Paiute territory in northeastern Oregon and northern Nevada. Whether or not the bands of central Oregon took part in any uprisings is unclear. However, the addition of horses allowed those individuals still reeling from the Tenino takeover of the Warm Springs hunting grounds to unleash their vengeance through a nearly-nonstop volley of raids that persisted for a number of years (Murdock 1938:399-400). Likewise, Klamath territory to the south was frequently subjected to the wrath of mounted Northern Paiute raiders (Zucker et al. 1983:88).

Armed Northern Paiute resistance to encroaching settlers and federal policies continued sporadically until late 1868 with the signing of the J.W.P. Huntington peace treaty (Zucker et al. 1983:103). In previous years, several unratified treaties failed to quell the violence between both sides (cf., Wheeler-Voegelin 1955-1956; Steward and Wheeler-Voegelin 1974). The 1868 treaty was also never ratified, but Northern Paiute leaders continued to insist on terms for their own reservation. Although some bands had already scattered to other reservations and colonies in southern Oregon, Idaho, northern Nevada and California, the Malheur Reservation was established in 1872.

Throughout the 1870s, Malheur residents continued to lose ground to settlers and land-hungry ranchers. After a number of residents left the reservation to participate in the Bannock War of 1878, most of the population was punished by being forcibly removed to the Yakima Reservation in Washington. Others managed to escape and find refuge at a number of other reservations and forts in Oregon, Washington, Idaho, California and Nevada. Immediately following the natives' departure, squatters descended upon Malheur lands. The reservation was officially closed by federal executive orders issued in 1883 and 1889 (Zucker et al. 1983:103-106; Fowler and Liljeblad 1986:457-459).

Maklaks (Klamath)

Archaeological evidence suggests that a large portion of south-central Oregon just east of the Cascades was occupied for at least 10,000 years by the ancestors of the ethnographic Klamath peoples. Klamath country stretched from the Klamath Valley in the south to the Cascade watershed in the west, northward into the high desert territory occupied by the Northern Paiute and possibly as far east as Chewaucan Marsh between Summer and Abert Lakes. There is no evidence that Klamath territory reached as far north as the headwaters of the Deschutes River, although occasional forays to this area may have taken place (Spier 1930:8-10).

Numerous theories have been proposed to explain the origin of the name "*Klamath*". Hudson's Bay Company explorer Peter Skene Ogden is often credited for coining the term in 1826 after learning of the "*Clammett*" or "*Clammitte*" from native groups he met along the Columbia River (Ogden 1909-1910). Other possible explanations suggest the name may be rooted in Chinookan terminology, spawned from a Yoruk word or derived from the Kalapuya term "*Athlamet*" (Spier 1930:1-2). Nevertheless, the Klamath referred to themselves as *Maklaks*, meaning "*men*" or "*the people*".

Ethnographers have divided the Penutian-speaking Klamath into six semi-autonomous "tribelets" (Spier 1930:12-23; Wheeler-Voegelin 1955:118; Ray 1963:203-204; Stern 1966:19; Minor et al. 1979:105-107). These designations are based strictly on geographical territories occupied rather than linguistic or cultural affiliation:

(1) Klamath Marsh-Williamson River Group (*A'ukckin*):

The largest known Klamath group with 29 settlements located primarily along the lower Williamson River and southern margin of Klamath Marsh.

(2) Agency Lake Group (*Kowa'cdikni*):

A very small group that may have splintered away from the Klamath Marsh band. One winter site has been recorded on the north shore of Agency Lake.

(3) Lower Williamson River Group (*Du'kwakni*):

Five settlements belonging to this group have been located on the north end of Upper Klamath Lake at the mouth of the Williamson River.

(4) Pelican Bay Group (*Gu'mbotkni*):

This group has been identified with settlements located on the west side of Upper Klamath Lake and on the marsh immediately north.

(5) Klamath Falls Group (*Iu'lalonkni*):

The southernmost Klamath group, known to have occupied a number of sites scattered over a large area in the vicinity of Klamath Falls along the eastern shore of Klamath Lake. Summertime sites were also maintained at nearby marshes and along Lost River.

(6) Upland Klamath of the Sprague River Valley:

Although these people have been linked with the Klamath Marsh group (cf., Spier 1930:21), Upland Klamath villages were widely scattered in remote, upriver locations. A number of areas around the Sycan River and Sycan Marsh provided many of the group's preferred resources.

Feuds and wars were common between different Klamath villages and tribelets (Berreman 1937:43). Kin groups frequently joined in the fray between rival villages, often resulting in mutual property destruction and slave-taking.
Despite their occasional animosity toward one another, all Klamath groups spoke the same language, shared the same cultural traits and considered themselves one people. Unity between tribelets became readily apparent when threatened by outside groups.

The Klamath have been described as centrally-based wanderers who practiced a semi-sedentary collecting strategy (Philipek 1982:18; Atwell et al. 1985:3-2). Their settlement and subsistence activities were based on responses to seasonally abundant food resources which could be found between their semi-sedentary winter villages and a number of temporarily-occupied sites. For a more-complete discussion of Klamath subsistence and economic activities, see Spier (1930:144-169) and Philipek (1982).

Beginning in March and lasting into May, Klamath winter village groups disbanded into family units to capitalize on rivers and lakes teeming with abundant spring fish runs. Suckers, salmon, trout, chub and minnow stocks were intensively exploited, and captured fish were cleaned and prepared for drying on the spot. By early summer, Klamath attention shifted away from the waning fish runs and toward gathering edible roots and plants in upland meadows and prairie habitats. Yampa, ipo, camas and arrowroot were considered especially important root crops. Intermittent fish runs were also intercepted when they could be found.

As summer wore on, particular emphasis was placed on collecting and processing wocas from marsh and lake areas. Wild celery, tule, cattail roots and waterfowl eggs were also gathered, along with a plethera of other edible and fibrous plants. While women were kept busy foraging and collecting near the wetter and grassy areas, men retreated to mountainous areas and forest openings to pursue large game (eg., deer, elk, pronghorn, mountain sheep, black and grizzly bear). Smaller animals such as marten, fisher, fox, coyote and waterfowl were also taken, often with deadfall traps.

Throughout the summer, the Klamath exploited an array of habitats spanning from the Klamath Basin to the eastern flanks of the Cascades. By early fall, groups still in the uplands were collecting berries, nuts, roots and late seed plants. Gathering activities were also supplemented by occasional hunting jaunts for large game and waterfowl. The Klamath commonly continued their mobile food gathering, hunting and fishing harvest well into mid-autumn.

> By the end of October, families began to reestablish their winter villages with the reconstruction, frequently in the previous year's pit, of their pithouse. Through winter, direct subsistence activities consisted only of

> minor fishing and hunting. Indirectly, subsistence activities were pursued through the manufacture, repair, and maintenance of the tools and materials necessary to sustaining the outlined subsistence pattern (Philipek 1982:31).

Caches of dried meat and fish helped tide over the Klamath during the winter months, with smaller amounts of fresh food coming from brief hunting and fishing trips. If stored food supplies were depleted before the arrival of spring, the people were known to survive by eating hides, lichens or the cambrium layer found beneath the bark of young ponderosa and lodgepole pines.

The semi-sedentary nature of Klamath villages meant that Klamath material culture had a greater inventory of items than that of their more-nomadic Northern Paiute neighbors (cf., Barrett 1910; Spier 1930:144-217). Thin, flat metates and two-horned mullers used for grinding wocus seeds are the most distinctive stone implements found in Klamath assemblages. Other common utilitarian tools include lava mortars, cylindrical pestles, bowls, local obsidian knives, scrapers, arrow and spear points. A variety of wedges, knives, awls, adze blades, fishing points and hooks were fashioned out of bone and horn. Twined or woven tule, grasses, bark and plant fibers were also important items used for making bedding, house coverings, cordage, basketry and bags. Woodworking was kept to a minimum, except for an occasional, trough-like canoe which was typically created by using fire to hollow-out an end-blunted ponderosa pine log.

Klamath shelters varied according to season and use (Spier 1930:197-206; Ray 1963:146-163). Winter earth lodges were typically large conical, semi-subterranean structures built to house several families. Some lodges were up to 35 feet in diameter and had pit floors ranging from two-to-four feet deep. Log beams and rafter supports framed the structures, and conical-shaped roofs were covered with tule mats and earth. Winter dwellings were dismantled in the spring and rebuilt with new timbers during the late fall.

Dome-shaped cook and storage huts were often put up next to the winter lodges. These bent willow pole-and-mat structures were smaller than the main living quarters, generally measuring about10 feet in diameter. Although used mainly for cooking or storage of bulky items, tools and winter supplies, abandoned huts were sometimes used as winter shelter by elderly people who had difficulty climbing in or out of the winter lodges. Likewise, similiar structures were built for use as menstrual huts and temporary dwellings during the spring and summer months.

Sweatlodges were also used by the Klamath. Winter sweats were dome-shaped structures that were covered with sticks, bark, dirt and grass. Summer lodges were somewhat bigger constructions blanketed with mats and grass. Heat was supplied by fire-kindled rocks brought from outside and placed in a hollow in the sweathouse floor. In addition to using both sweatlodge types for various spiritual, shamanic and body cleansing rituals throughout the year, the Klamath also maintained larger, winter earth lodge-like sweathouses reserved specifically for mourning rites.

Archaeological remains found throughout the upper Klamath Basin indicate that Klamath culture has persisted for at least several thousand years. Investigations conducted by Cressman (1956) on middens, caves and pit house sites in the upper Klamath Basin infer long-term cultural stability of peoples adapted to lakes, marshlands and riverine habitats, possibly pre-dating the Mazama eruptions of 6800 B.P. Subsequent studies have refined the time depth of the Klamath ethnographic land use pattern to 5,000-6,000 years (Aikens and Minor 1978; Sampson 1985). Additional research has shown that Klamath economies had become well-established by at least 2,000 years ago (Atwell et al. 1994:1.3.1).

Cressman's view of a relatively persistent, unchanged cultural lifestyle in the Klamath Basin has been somewhat criticized by Thompson et al. (1979). The authors suggest that the appearance of long-term cultural continuity among the Klamath may have been biased by Cressman's primary focus on sites located near major water sources and lack of attention to those in other environments. However, Philipek's (1982, 1986) analysis of site location in various ecosystems of the northern Klamath Basin has yielded results striking similar to Cressman's original conclusions:

> These correlations support Cressman's theory of long, stable, and heavy reliance upon and utilization of aquatic, riverine, and marsh resources. Upland resources appear to be used infrequently and are of minor importance to total subsistence resources collected throughout the post-Mazama aboriginal period. The evidence for upland subsistence utilization presents, perhaps, a picture of occasional upland hunting which the eleven small lithic scatter sites and six isolated finds may represent as chipping stations, kill sites, butchering sites, waiting areas, and lost projectile points from the chase. This economic model appears to represent the observed ethnographic pattern of heavy reliance on aquatic resources along the major water bodies with upland resources and game of minor importance (1986:42-43).

Klamath relations with other peoples are best described as complicated and, at times, opportunistic. Although most historic reports suggest they were generally friendly with the Sahaptin peoples occupying the Columbia River Basin, Spier (1930:24-25) notes they were infrequently subjected to slave raids from the north. Moreover, the Klamath also levied periodic assaults on selected neighboring populations, including other Klamath villages and kin groups.

> Besides the close bond with the Modoc, normally friendly relations are maintained with the Molala across the Cascades, the Watankni (Warm Springs people) of the Deschutes, and the Wishram-Wasco at the Dalles. Warfare is directed toward all other directions. Raids are exchanged with the Shasta several days' journey down the Klamath River, the Upland Takelma on the Rogue River, and the Northern Paiute (Snake) of the desert to the east. The Klamath fight the Kalapuya and take horses from the Warm Springs Indians (Spier 1930:24-25).

A profit motivation appears to have been one of the driving forces behind the Klamath's increasing propensity to raid their neighbors during the early to mid-1800s (Stern 1966:23). Captured goods and slaves were sold or traded for horses, guns and other coveted provisions. In addition to dealing in pilfered booty, the Klamath also participated in the intertribal trade complex centered at the Dalles on the Columbia River. In exchange for slaves, wocas, Pit River bows, beads and other items from the southern Oregon region, the Klamath acquired horses, buffalo hides, blankets, dried salmon, dentalium and ornamental effects (Spier and Sapir 1930).

By the mid-1800s, continual displacement and habitat destruction caused by trespassing settlers, livestock herding and mining roused Klamath aggravations to the point where they allied with the Modoc, Shasta, Takelma and several other groups in the Rogue River wars of 1853-1856 (Beckham 1971). Pressure from ongoing wagon road construction and military campaigns eventually forced the Klamath to join the treaty-making process in the 1860s. In an attempt to ensure the safety of increasing numbers of travelers passing through south-central Oregon while enroute to California and southern Idaho, federal agents prepared a treaty that was signed by the Klamath, Modoc and several Northern Paiute bands on October 14, 1864 (Zucker et al. 1983:88). The agreement ceded over 13 million acres to the United States and retained about 1.1 million acres for a reservation on the north end of Upper Klamath Lake.

Government and military ignorance of native territories and age-old animosities between certain groups became appallingly clear when an amalgamation of Klamath, Modoc, Pit River, Shasta and Northern Paiute bands from across southern Oregon and northern California were placed on the same reservation. The Modocs were upset about being forced to settle on traditional Klamath lands, especially after agreeing to an earlier treaty that allowed them to remain in their Tule Lake homeland. Many resettled Northern Paiutes refused to live among the other groups and would leave seasonally to hunt and gather in their traditional areas. Resistance to harsh reservation policies came to a head in 1872-1873 when Kientapoos (nicknamed "Captain Jack") led a band of Modocs in an uprising against the U.S. Army that lasted for several months (Thompson 1971; Ruby and Brown 1981:211-223).

By 1875, the entire Klamath Reservation population was lumped under the "Klamath Tribe" moniker. The following decades were punctuated by a continual influx of Euroamerican settlers, land-hungry commercial interests, corrupt government agencies and raids by outsiders. Such abuses took a heavy toll on the reservation's territory and inhabitants. Federal assimilation policies broke up families, many traditional subsistence and religious practices were suppressed and native land holdings were progressively stripped. Over time, native sociopolitical structures and belief systems gradually gave way to a Euroamerican-styled, monetary-based economy (see Stern 1966 and Zucker et al. 1983:107-111 for discussion of Klamath Reservation history).

Euroamerican Exploration and Settlement

Euroamerica got its first taste of the central Oregon landscape with the expeditions of fur trappers during the early-1800s. In 1825, the British-based Hudson's Bay Company also began to show an interest in tapping the region's fur-producing potential through its sponsorship of the McDonald-McKay expedition. The group made its way down the eastern flank of the Cascades and followed the Deschutes and Little Deschutes Rivers until eventually reaching Klamath Marsh (Davies and Johnson 1961:34). During the following year, Hudson's Bay explorer Peter Skene Ogden and his party became the first whites to visit East Lake in Newberry Crater before heading south along the Little Deschutes River to Klamath Lake (Elliott 1910).

On November 25, 1843, Second Lieutenant John C. Fremont and his guide Thomas Fitzpatrick left the present location of The Dalles and journeyed south toward Klamath Marsh. The route they followed took them in part along the path blazed by Peter Skene Ogden. Sometime around December 7 or 8, the pair reached the present site of Crescent. An entry recorded in Fremont's journal on December 7 describes his impressions of the area:

> The great beauty of the country in summer constantly suggested itself to the imaginations; and even now we find it beautiful, as we rode along these meadows from half a mile to two miles wide. The rich soil and excellent water surrounded by noble forests made a picture that would delight the eye of the farmer (Nevins 1956:318).

Word of these expeditions and the landscape's natural abundance began to spark excitement for developing a route that could bring emigrants to the area. A road-viewing expedition was mounted in 1852 by John Diamond, W.T. Walker (or possibly Robert Fletcher Walker), J. Clark, Alexander King, William Macy, Joseph Meadows and William Tandy, explicitly to find a path that could be developed between Eugene City and Fort Boise (Menefee and Tiller 1976:325). A potential wagon route was found up the Middle Fork of the Willamette River to the Cascades summit (along which they named Diamond Peak and Walker Range). East of the Cascades, the group continued traveling north until reaching the present location of Bend.

Although three of the men were wounded in skirmishes with undetermined native groups during the journey, all returned safely to the Willamette Valley by way of the Barlow Road (Neilson et al. 1985:168). The group's efforts eventually led to the construction of the Elliott Wagon Road and Oregon Central Military Wagon Road. Likewise, the Pacific Railroad Survey of 1855 complemented the earlier wagon road surveys by serving as a pathfinding mission for a new railroad route between the Columbia River and Sacramento (Abbott 1856).

The complex philosophico-politico-economic concept of "Manifest Destiny" which became particularly prevalent in the United States during the 1840s justified, in part, the Euroamerican belief that it was their *right* and *destiny* to take control of the land from its original inhabitants. A major avenue used in the surge to stretch across the continent was the Oregon Trail, the main transportation artery at the time for emigrants traveling to the Oregon Territory. From its beginning in Independence, Missouri, the trail headed west across the High Plains and through the Rockies to the Snake River at the Oregon-Idaho border. From there, the route turned northwest, passed over the Blue Mountains and then threaded westward to the Dalles on the Columbia River. Emigrants then had a choice between rafting downstream to Fort Vancouver and following the Willamette River into the Willamette Valley, or traversing the Cascades via the Barlow Road.

Although the original Oregon Trail route was considered the best way to come west, a faster, more-central path that would cut through the Cascades was soon sought. The first attempt was made in 1845 when Stephen H.L. Meek convinced between 1,000-1,500 settlers to follow him on a new path that later became known as "The Meek Cutoff". The wagon train left the Oregon Trail at the Snake River and headed through the Harney Basin to the Silvies River and then toward the Wagontire Mountain Range. The trip was marred by so many hardships that the group ultimately fell into mutiny. Small parties of wagons began splintering away and headed north to The Dalles. By the journey's end, as many as 25 people had lost their lives (Sutton and Rogers 1988).

Two other overland routes played key roles in the Euroamerican settlement of central Oregon. The Elliott Wagon Road and Oregon Central Military Wagon Road opened areas previously avoided by early white travelers because of the ruggedness and inaccessibility of the terrain surrounding the Cascade Range. The following discussions of both trails are based on an summaries produced by Sutton and Rogers (1988):

Elliott Wagon Road

In 1853, the Oregon territorial legislature contracted for a new central road that would provide access to the Willamette Valley through the the central Oregon region. The trail would allow wagons to move directly west from the Snake River across the high desert to the Deschutes River, pick up another road that would pass through the Cascades and then down into the Willamette Valley. After the contract was awarded to Dr. Robert Alexander, construction was started but never completed. Alexander contended that he had to terminate his crew because the road was not pre-marked. The case subsequently went to court and the contract was given to Ashel C. Spencer. Spencer continued road construction east to the Deschutes River (Menefee and Tiller 1977a:41-72; 1978). The route eventually became known as the

Elliott Wagon Road, Elliott Cutoff, Free Emigrant Road, Greenhorn Road or Lost Wagon Train Road.

The first-attempted journey down the new road took place in 1853 when Lane County resident Elijah Elliott (or Elliot) was commissioned to encourage emigrants to take the new route. After traveling east to meet his family at Fort Boise, Elliott convinced a group of 1,027 people with 250 wagons and hundreds of cattle to follow the road. However, Elliott failed to mention that the path was still under construction west of the Snake River. Upon crossing the river, the party entered Oregon's high desert and became lost. By October, the group had found its way to the Deschutes River near Bend.

Rather than finding the expected road at the Deschutes River, Elliott's party only found Spencer's blazed trail. As the emigrants followed the trail south, they found it increasingly difficult to cross fallen timber strewn across the path. The party soon lost confidence in Elliott's leadership, stripped him of his command and threatened to hang him. While the group was stranded in the woods, volunteers traveled west over the Cascades to summon help in the Willamette Valley. A relief party later rescued the ill-fated travelers and led them to safety. Most of the wagons had to be left behind for the winter. A successful crossing finally occurred in the fall of 1854 when William Macy led a emigrant train over the road with no apparent incident.

Remnants of the Elliott Wagon Road still cut a visible swath through portions of the Deschutes National Forest immediately east of the Cascade crest (Fig. 8). Wagon ruts can be seen east of Crescent Lake where Highway 58 crosses Crescent Creek and along the junction between Big Marsh Creek and Crescent Creek. The road roughly parallels the eastern side of Big Marsh Creek on a hill until crossing Big Marsh via a bridge on private property (i.e. noted as "Menefee's" or "J.G. Collins Ranch" on some topographic maps). The trail is believed to have followed the route traced by Forest Service Road 244 (6020) from the Umli siding on the Southern Pacific Railroad tracks toward the southwest corner of Crescent Lake. From there,

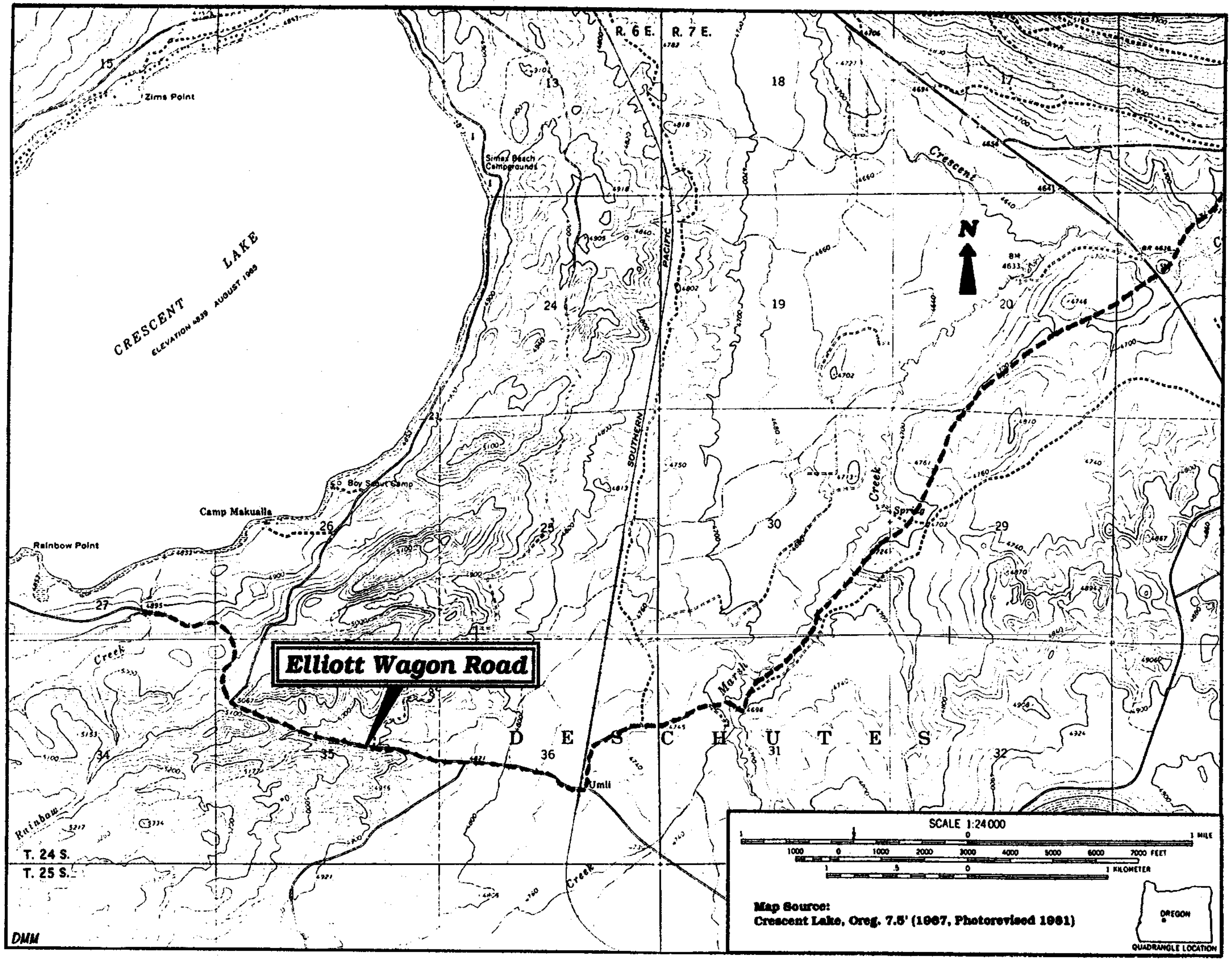

Fig. 8. Approximate route of the Elliott Wagon Road near the Crescent Lake area.

all vestiges of the former road were obliterated by the later Oregon Central Military Wagon Road and construction of Forest Service Road 244.

Oregon Central Military Wagon Road (OCMWR)

The opening of the Elliott Wagon Road was a boon to farmers and ranchers in the Eugene-Springfield area who wanted to take their produce and cattle to potential markets east of the Cascades. Eastside markets became further inviting after the discovery of gold in Idaho's Owyhee River area some 10 years after the rescue of the ill-fated Elliott party. Such developments and possibilitites compelled a group of investors from Lane County to form the Oregon Central Military Wagon Road Company in the spring of 1864. Under the leadership of Oregon Surveyor General Bynon John Pengra, the group intended to build a road through the Cascades that would link the upper Willamette Valley with the southern and eastern portions of the state.

Later that year, the federal government and Oregon State legislature approved the company's request for a land grant. In return for constructing the road, the group was to receive alternate odd-numbered sections that would be three-sections wide on both sides along the entire length of the route. The developers then planned to sell land to homesteaders who could use the road as a route for travel and delivery of commerce goods. Friends of La Pine County Library (1983:11) note that Pengra further envisioned the OCMWR grade as a future railroad that would connect the Willamette Valley with the transcontinental Central Pacific Railroad somewhere in Nevada. Although the task was not accomplished during Pengra's lifetime, a railroad was completed through the same general area (but not the exact OCMWR route) in 1928.

In 1865, Pengra joined William Holms Odell and a military escort on a reconnaissance survey for the new wagon road (Minor et al. 1979; Nielson et al. 1985). Construction began in the summer of 1865 and continued until 1870. By then, the road had been built and improved from Eugene to the Deschutes River (Beckham 1981:117). After opening additional routes southward to Fort Klamath and east to the Sprague River watershed, the developers abandoned further road construction and improvement, choosing instead to focus on selling lands which had been aquired earlier.

The OCMWR Company soon faced the burden of paying property taxes as it began taking title to its lands. The properties were not easy to sell because many were in a wilderness area and offered little chance of an immediate return. Furthermore, homesteaders preferred buying land set in even-numbered sections rather than purchasing tracts from the OCMWR developers. The decline in profit-making eventually led the company to sell its interests to the California and Oregon Land Company in 1874. The new company eagerly pursued land transfers and neglected to further construct and improve the road.

While public criticism mounted because of construction failures east of the Cascades, it became increasingly clear that both companies had intended to skim off vast tracts of land for personal gain. Further complicating the issue were 100,000 acres of Klamath Indian Reservation land claimed by the developers. Litigation followed and settlements were finally made in federal court (Beckham 1981:117-121).

Although there were a number of problems with the OCMWR, it still played an important role in the development of Oregon. The road became a major travel route for emigrants, livestock, packers and drovers passing between the Willamette Valley and central and southeastern Oregon. One measure of the road's significance can be found in records maintained by Stephen Rigdon, who, along with his wife, maintained an OCMWR way station along the Middle Fork of the Willamette River between 1871 and 1896. The couple provided meals, offered livestock grazing services, made blacksmith repairs and sold small items to travelers. Rigdon's records also indicate the OCMWR was used during a large eastward migration from the Willamette Valley to the lake valleys of eastern Oregon, as well as serving as a funnel for many cattle being moved to the railhead at Winnemucca, Nevada.

Information about the OCMWR becomes sketchy after the discontinuance of Rigdon's notes in 1896. The road continued to be used as a main thoroughfare until improved road systems were constructed over the Cascades in the 1920s. During the 1930s, Civilian Conservation Corps crews made improvements and provided maintenance to the OCMWR. Since then, some segments of the road have been obscured by forest regeneration, while others have been paved or obliterated by U.S. Forest Service activities (Fig. 9).

Additional overviews of Euroamerican expansion into central Oregon and the relationship to native peoples can be found in Menefee and Tiller (1977b, 1977c, 1977d, 1978), Minor et al. (1979:137-208), Toepel et al. (1980:130-165), Zucker et al. 1983 (58-126), Clemmer and Stewart (1986:525-557), Malouf and Findlay (1986:499-516) and Lebow et al. (1990:73-78).

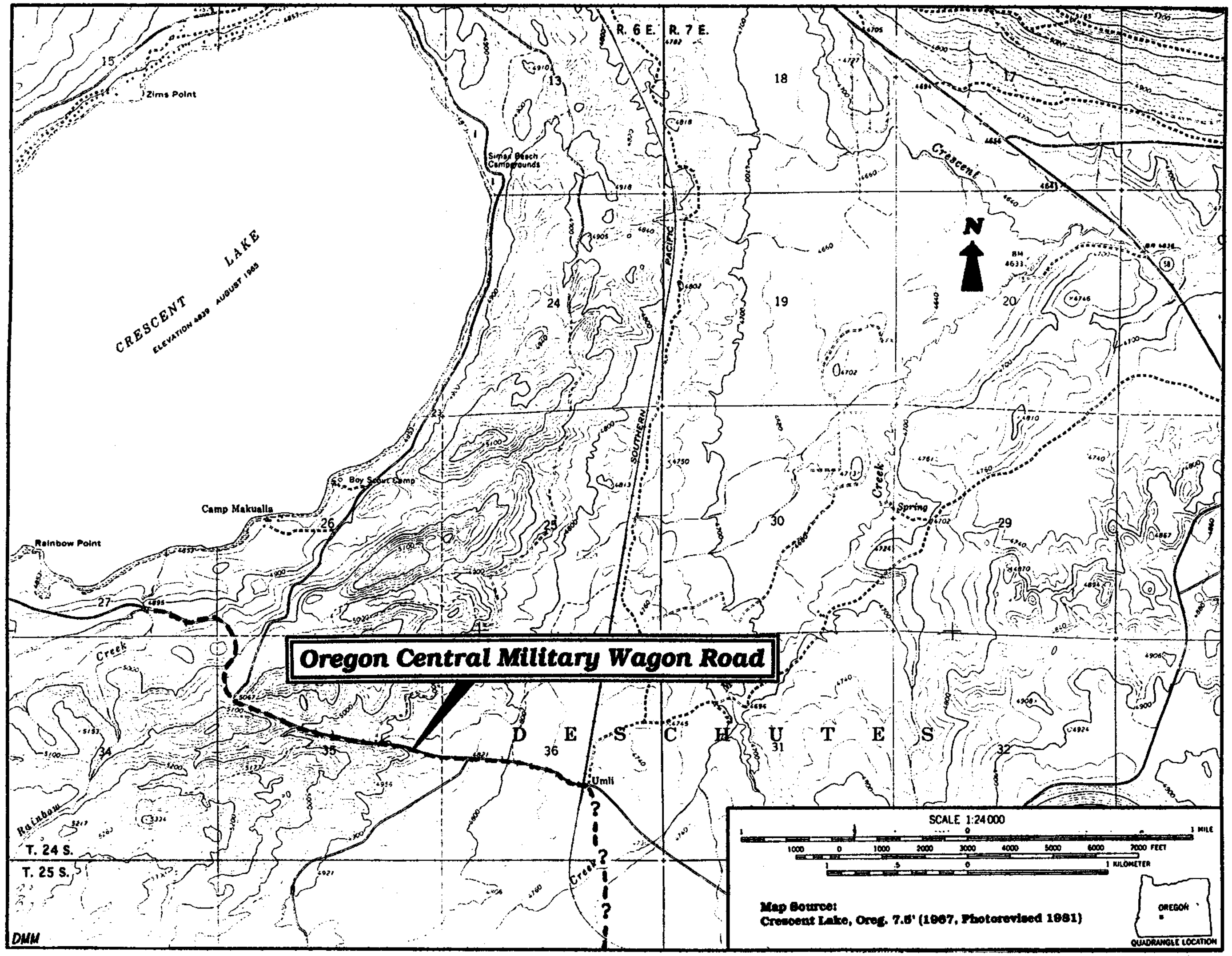

Fig. 9. Approximate route of the Oregon Central Military Wagon Road near the Crescent Lake area.

Chapter 4: MODELING PREHISTORIC USE OF THE CENTRAL OREGON CASCADES

The Model Concept

Before reviewing current approaches to interpreting the archaeological record of long-term human use of the Cascade Range, it is necessary to briefly discuss an ongoing problem that has become prevalent within the archaeological research community. The misuse, abuse and/or misunderstanding of the term "model" continues to proliferate archaeological literature to the point that the word is now frequently used in place of more-appropriate terms such as *hypothesis*, *theory*, *generalization*, *empirical equation*, *hunch* and, in some cases, *guess*. Similarly, there are as many definitions for the word "model" as there are archaeologists willing to wave the model flag every time another explanatory or conceptual system is devised to help explain settlement and land use patterns. Unfortunately, a growing number of these so-called models do not pass muster when it comes to fulfilling the basic framework that is necessary to be considered a bona fide, viable model.

There are no absolute criteria for distinguishing models from other explanatory systems. However, somewhere within the swirling void of endless definitions that sweep the gamut from blatant vagueness to polysyllabic ego-babble lies a simple description that has been too easily lost by many of the scientific and research disciplines:

> Models are analogies.
>
> Scientific or engineering models are representations, or likenesses, of certain aspects of complex events, structures, or systems, made by using symbols or objects which in some way resemble the thing being modeled (Chapanis 1963:109).

This straight-forward definition clearly exposes the basic strengths and weaknesses of models. More importantly, the mysterious or "magic" connotations that sometime tend to revolve around what models are and how and why they are derived are removed if these fundamental properties are kept in mind.

In an effort to better-understand the benefits, dangers, fallacies and confusion often involved in constructing and using models, it is important to make a distinction between models and other conceptual systems (eg., theories, hypotheses and generalizations). Chapanis (1963:112) notes that if a model is viewed as an analogy, all facets of the model cannot be expected to be completely accurate, just as most analogies are never *completely* accurate. Rather, a model serves as a statement which describes how an object, process or phenomena behaves. An example of a computer serving as a model for a human brain helps to illustrate this point; although the functional processes between the two are analogous, this does not necessarily mean that human heads are also full of wires, silicon chips and soldered connections.

Furthermore, models provide an external organization for relationships, laws or ideas which aid in the development, application and interpretation of theoretical constructs (Lachman 1963:79). By contrast, theories are conceptual systems which attempt to describe something in its *complete* form.

> The basic elements, or pieces, of a theory are actually supposed to be there in the thing about which you are theorizing and they are supposed to behave the way the theory says. Whereas a model can tolerate some facts which are clearly not in accord with it, facts which do not agree with theory are fatal to the theory (Chapanis 1963:112).

The archaeological community has yet to settle on the proper usage and distinctions between these concepts. Consequently, this problem has become especially prominent in many reports that proport to offer models for one thing or another. More often than not, these so-called "models" are by definition *not* models, but rather some other type of *conceptual framework*. Although most authors who propose new interpretive constructs do so in good faith, many appear to have a basic misunderstanding of what constitutes a true model as opposed to other types of conceptual systems. Such is the case with the state of model-building for the prehistoric use of the Cascade Range.

As highlighted by Burtchard (1990:6-25; 1991) in his critique of current approaches to modeling long-term human adaptation processes in the Cascades, several factors continue to hinder a better understanding of what was going on in the mountains during prehistoric times. Problems with temporal control, limited data bases, variable research strategies and interpretive ambiguities continue to preclude broad regional and long temporal syntheses of how people adapted to the Cascades. In turn, Burtchard argues that one of the most effective ways to deal with such difficulties is through construction and evaluation of regional and temporal land-use models:

> Models apply a set of assumptions about the character of human behavior in order to predict broad, idealized patterns in the ways people organized their use of resources and space, and the ways in which those patterns should have changed through time. Implications of these models may then be taken to the archaeological record to examine the extent to which available data are consistent with expectations. To the extent that available data and modeled expectations coincide, they may be retained as plausible reconstructions of the past. Through repeated feedback between modeling, data aquisition, evaluation and refinement, we hope to improve the accuracy of our understanding of long-term organized use of the earth (Burtchard 1990:180).

On the surface, Burtchard's call for model development to help elicite more information about life in the Cascades appears well-founded and reasonable. However, given that so little is known about who these people were, where they were from and what the broad extent of their upland activities consisted of, it is highly improper to label any new theoretical or highly-elaborated concept a "model". Instead, such constructs may be better-viewed as "conceptual frameworks" because, although they do attempt to represent an analogy or comparative structure for how and why human systems and behaviors (i.e. settlement patterns, land use practices, etc.) occurred, the evidential or factual bases are either missing or extremely limited.

At present, too little archaeological and ethnographic data are present to either validate or reject many of the proposals and scenarios set forth by most Cascadian use "models". In many cases, it is difficult to determine how such elaborate schemes were even derived. In an apparent attempt to compensate for the lack of information necessary to build testable models, some authors have imposed archaeological and ethnographic patterns onto the region which are, in some cases, taken from cultural units far removed (and possibly unrelated) in time and space from groups who occupied the Cascades.

However, this is not to say that ideas and proposals contained within many of these approaches cannot serve as *frameworks* for comparison and testing of new archaeological data as it becomes available. On the contrary, they can be essential conceptual platforms from which ideas and perceived patterns for the region can be continually reevaluated and refined. Once a more-comprehensive data base is accumulated from the Cascades, the notions already set forth may then be further evaluated to see if they can be used to develop full-fledged models.

The State of Modeling in the Cascades

Efforts to interprete the archaeological remains and prehistory of peoples who lived in the central Oregon Cascades have generally taken one of two very different approaches. Traditionally, many researchers have adopted a cultural historical perspective, whereby variations in the archaeological record are interpreted as markers between socially- and temporally-distinct cultural groups. This long-standing tendency toward focusing a particularistic eye on morphological variation and composition changes has led a number of archaeologists to embrace a somewhat myopic view of human adaptive systems. Moreover, cultural historical adherents often place far more importance on social variables as a driving force behind archaeological change than they do on the influence of environmental factors.

In contrast, archaeologists striving to develop ecological and functional explanations for assemblage variations tend to look at changes as human adaptive system responses to various environmental processes. Rather than interpreting variations as necessarily representing changes in cultural affiliation or temporal placement, ecological/adaptational interpretations are inclined to attribute changing archaeological remains to subsistence and settlement strategy changes brought on by basic ecological processes. Climatic shifts, variable food abundances, changing population densities, as well as many other types of eco-environmental fluctuations are viewed as important selective mechanisms that drove groups to develop new or different tool kits to accommodate changing economic strategies. Unlike the microscopic bent of the cultural historical approach, the ecological/adaptational perspective tends to focus on deciphering broader patterns and changes in varying environmental contexts through time and space.

Ideally, the most-balanced interpretation of archaeological remains would fall somewhere between the cultural historical and ecological/adaptational approaches, or, would at least attempt to incorporate elements of both perspectives. Interpretations from sites throughout the central Oregon Cascades have run the theoretical gamut, with many researchers taking an obvious cultural historical slant in their bids to assign sociocultural affiliation to peoples who discarded the lithic remains. Although numerous explanations offered in archaeological reports from sites in the Cascades have never been followed up on or more-fully developed, four influential interpretations or approaches to understanding human use and settlement in the mountains are worth noting (eg., a thorough treatment of the different interpretive approaches used to describe the archaeology of the Cascades can be found in Burtchard 1990 and 1991:6-25):

Cultural History in the Central Oregon Cascades

Minor (1987:41-48) proposes a four-stage cultural chronology for the Upper Willamette Valley and Western Cascades which was designed to help explain how and why people lived and traveled in the mountainous uplands. The Cascadia Phase (ca. 8000 to 6000 B.P.) is characterized by broadly-based cultural traditions which used lanceolate and foliate Cascade projectile points as primary weapons systems. Baby Rock Phase (6000 to 2000 B.P.) sites and assemblages are represented by the appearance of broad-necked dart points and ground stone. A widespread distribution of Cascadia and Baby Rock Phase point styles in the mountains is interpreted as evidence for seasonal use of the uplands during these periods.

Minor's final two stages theorize the development of an indigenous mountain culture, possibly coincident with the arrival of Molala populations. Rigdon Phase (2000 to about 200 B.P.) assemblages are identified by the presence of arrow points, distinguished by neck widths which measure less than 7 mm. As groups occupying the uplands began to "settle in", the distinctiveness of the "Molala" pattern continued to diverge. The Ethnographic Phase encompasses archaeological manifestations dating from the beginnings of Euroamerican contact to the final removal of native groups to reservations.

The "model" devised by Minor can be criticized on several fronts. Foremost is the assumption that morphological continuity among artifact styles equates with cultural continuity. No consideration is given to the possibility that similar morphologies found throughout the uplands may reflect a kind of adaptive continuity. The proposed sequence also fails to explain how and why groups would have given up a broad-based land-use strategy for a more locally-based upland system over a relatively brief period. Finally, it would be pure speculation to try to impose the surmised patterns or traditions upon upland areas beyond the Western Cascades, especially since no archaeological material found east of the Cascade crest was incorporated in the chronology's design.

In his critique of cultural historical interpretations, Burtchard (1991:7-8) chides cultural chronologies such as the one proposed by Minor for not relating recovered archaeological materials to broader human social processes. Considering that artifact assemblages from different archaeological sites rarely exhibit traits that are little more than broadly similar, culture-specific chronologies have nevertheless developed an amazing ability to expand infinitely to accomodate an array of archaeological variations in an effort to expose unique characteristics that can be interpreted as evidence for distinct sociocultural populations and/or broader cultural/temporal phases. Burtchard suggests that this shortsighted search for links has paved the way for contradictory or ambiguous interpretations of variability that continue to plague cultural historical approaches.

The inability to filter out overlapping territorial boundaries is another issue that severely limits the use of artifact assemblages to infer sociocultural affiliation. This problem is readily apparent when dealing with the archaeology of the central Oregon Cascades, especially when considering the region's unique geographic position between a number of distinct cultural areas.

> There is no compelling reason to expect rigid boundaries to have existed throughout much of the prehistoric past when populations were low relative to available resources. Over time, a wide range of socially distinct groups could be expected to exploit a given area; each adding their remnant features, detritus and lost tools to the archaeological record of that spot. In many montane sites, where sediment accumulation is slow and pedoturbation high, the assemblages we eventually recover reflect a composite of such past multiple-use events. The assemblages we analyze, then, often represent a cultural palimpsest rather than data that we can attribute to particular sociocultural entitites. The variability we see is as likely an artifact of historic accident as a reflection of genuine culture historical reality (Burtchard 1991:8).

Ecological Approaches in the Central Oregon Cascades

Several authors have approached their studies of prehistoric use of the central Oregon Cascades from more of an ecological perspective. Analyses presented by Baxter (1986) and Snyder (1987) help draw attention to the crucial role played by the environment in shaping upland land use patterns. As noted by Burtchard (1991:8),

> ecological approaches necessarily assume that human cultural systems are imbedded within larger ecological systems, and that certain cultural phenomena (as reflected in the archaeological record) are explainable by reference to interaction with the larger system. Such approaches offer particular advantages in explaining macroscopic issues such as dispersal of human settlements across

> the landscape, basic resource exploitative patterns, the character of technologies used to manipulate elements of the environment, and the causes of changes in these patterns through time.

Baxter (1986) proposes a cultural chronology and an environmentally-grounded land use "model" for the west slope of the Cascades along the Upper Middle Fork of the Willamette River. Based on findings from four sites in the Upper Middle Fork drainage, Baxter's four-stage chronological sequence is very similar to Minor's (1987:41-48) plan. The Oakridge Phase spans from 8,000 to 6,000 years ago and is characterized by a predominance of foliate points. The appearance of broad-necked stemmed and notched points ushers in the long-lived Staley Phase, beginning around 6000 B.P. and lasting until roughly A.D. 1400. A major technical change is implied in the subsequent Colt Phase with an influx of small narrow-necked arrow points. The final stage, the Horse Pasture Phase, begins after A.D. 1800 with the arrival of Euroamerican goods and continues into the historic period.

In addition to his cultural sequence, Baxter (1986:160-180) also offers a detailed "model" for prehistoric subsistence and settlement. The cultural manifestations described in his chronology are believed to have maintained economies driven and shaped by the study area's ecological make up. Molala and Kalapuya ethnographic patterns were placed into a larger land-use scheme that was developed by comparing the distribution of all known site locations in the Upper Middle Fork area against the distribution of upland plant communities. From this, Baxter was able to derive a land-use strategy that focuses on sedentary winter villages. Accordingly, the annual round began during the winter months as multiple family groups congregated at settlements located in broad valley lowlands. Throughout the winter, nearby plant food communities and passing deer and elk herds were exploited as needed.

During the spring, small family groups moved away to base camps along mid-elevation drainages. The amount of time spent at each camp depended on the availability of the nearby dispersed plant resource base. Baxter assumes that upland plant and animal populations were distributed in a relatively homogeneous manner, and that placement of base camps at mid-elevations would have allowed maximum access to areas with preferred montane resources. By summer, the same mid-elevation base camps served as staging points for task-specific groups making short-term trips into the uplands in search of game, berries and plant foods.

Briefly-used, task-specific sites also appeared at higher elevations during the mid- and late-summer as migrating game animals began to move into mountainous areas and upland huckleberries began to ripen. As late autumn approached, the annual cycle began to wind down as dispersed populations descended back to their valley villages. Winter food stores and easy access to large game winter ranges helped sustain the congregated populations until the cycle could start over again during the spring months.

Snyder (1987) follows a similar track in her argument that prehistoric occupants of the central Oregon Cascades tied their land-use strategies to the patterned distributions of montane plant and animal populations. She further contends that cultural groups frequenting the mountains were either lowland-based, semi-sedentary populations that supplemented their diets with plants and animals obtained in the uplands, or more broad-ranging, mobile hunting and gathering peoples that focused on the same resource suite. All groups, however, maintained a seasonal transhumant lifestyle designed around scheduled movements that allowed them to take advantage of sequentially-ripening plant foods and the upward migrations of game populations.

Snyder's study area cross-cuts the west and east slopes of the Cascades in a 19-km (12-mile) wide swath between the Middle Fork of the Willamette River and upper Deschutes River (1987:68-70). Statistical comparisons of known site densities with land types on both sides of the Cascade crest revealed that site distribution patterns are closely-linked with stable, biotically-rich natural settings such as mires, meadows, dry forest clearings, rocky outcrops, springs, lakes and major water courses. In contrast to Baxter's assumption that critical floral and faunal habitats were evenly distributed across the uplands, Snyder contends that favored resources tended to be found in clumps. Wet meadows and non-forested clearings were especially favored areas that provided stable and productive environments for wild game and a spectrum of edible plants. Such locations are hypothesized to have been culturally-important environmental features to many of the region's peoples throughout most of the Holocene.

According to Snyder's findings, the landscape's elevational position has little to do with determining where seasonal base camps and short-term extractive sites may have been located. Rather, identification of land types is the critical cog necessary for predicting where prehistoric upland activity areas likely existed (1987:138-145). Populations exploiting the central Cascades appear to have preferred areas near wet meadows primarily because the surrounding terrain served as resource catchment zones. Habitats in these areas would have provided an optimal assortment of roots, berries and other montane plant foods. In addition, deer and elk herds would have congregated near these locations during the late-summer and autumn months. Snyder theorizes that groups exploiting these areas probably returned annually to the same locations to take full advantage of each year's seasonal bounty.

Although Baxter and Snyder have both offered frameworks for how and why humans used the mountains during the late-prehistoric period, Burtchard (1991:11-12) argues that neither addresses changing subsistence and enviromental variables that would have affected land-use patterns during the earlier days of the Holocene. Of particular concern is the unresolved question of why peoples who had maintained long-standing mobile foraging economies would have shifted to strategies involving "varying degrees of sedentism and more complex social organization" (1991:13). As a result, Burtchard (1990:14-25; 1991:14-25) proposes another ecologically-based "model" that attempts to explain central Cascades settlement and subsistence system changes through time.

Burtchard's scheme is meant to be a working framework from which ecological and processual assumptions can be applied to help predict broad, general patterns practiced by humans throughout their tenure in the central Cascades region. The areal extent of the central Cascades is roughly bounded on the north by the Cowlitz River and extends southward to the Umpqua divide (Burtchard 1990:36). Concepts and assumptions originally developed for modeling prehistoric population dynamics in the northern Rocky Mountains (Burtchard 1987) have been modified for use in the context of the central Cascades uplands. Similarly, the "broad-spectrum foraging" versus "semisedentary foraging" pattern nomenclature proposed by Schalk and Cleveland (1983) and applied in a long-term use model for the northern Cascades (Mierendorf 1986) has also been incorporated. Burtchard organizes central Cascades prehistory into five phases, each defined by major environmental stages and/or time periods that are identified with particular subsistence and settlement strategies:

(1) Early Broad-Spectrum Foraging (ca. 13,000 to 8500 B.P.)

The earliest use of the Cascades is proposed to have begun by 10,000 B.P., and possibly as far back as 13,000-14,000 years ago. During the waning days of the Wisconsin glaciation, small groups of highly-mobile hunter-foragers are thought to have keyed their movements to the distributions of mega and mesofaunal animals. Continued warming during the late Pleistocene/early Holocene led to a gradual expansion of montane ungulate habitats and simultaneous decline of megafaunal habitats. By circa 10,000 B.P., alpine deglaciation and expansion of grass-parkland habitats in the central Cascades are believed to have allowed elk and deer herds to move in, setting the stage for a foraging strategy shift toward a focus on mesofaunal populations.

Small-scale foraging groups following a highly-mobile transhumant pattern between the lowlands and uplands are thought to have hunted migrating big game animals and foraged for a broad range of montane plants and smaller animals. Sites are expected to be few and limited in size. The demands that come from exploiting a range of environmental contexts means that artifacts should be stylistically generalized, simple, multifunctional and easily transportable. Population densities were probably low and characterized by widely-scattered, residential social groups.

(2) Mesofaunal Broad-Spectrum Foraging (ca. 8500 to 5000 B.P.)

This period is marked by a general drying trend, continued retreat of alpine glaciers and encroachment of more-xeric grasses and parkland habitats in the montane uplands and wet western valleys. An increase of ungulate forage in the mountains and concurrent dessication of favorable resource habitats in the Great Basin and Columbia Plateau should have led more people to migrate into the central Cascades, resulting in a greater frequency of higher elevation forager sites. Big game hunting and foraging is thought to have continued as the dominant subsistence base, reflecting a continuation of the small-scale, highly mobile pattern of residential movement that began during the earlier period. Artifact densities are expected to remain low because of small group size, short-term residency and irregular site reuse. Likewise, archaeological assemblages are expected to reflect a simple, generalized big game hunting technology with a large percentage of expediently-manufactured residential tools.

(3) Early Semisedentary Foraging (ca. 5000 to 2500 B.P.)

The return of more-mesic environmental conditions at the end of the Altithermal led to a reduction of big game habitat as forest cover began to increase in the mountains and western lowlands. Although the increase in forested environments would have varied locally and temporally, human populations would have eventually felt the impact as an overall decline in the productivity of their primary resource base. As open habitats changed to forest, large gregarious ungulates such as elk would have been replaced by smaller, more-solitary animals. Other problems related to the already-declining ungulate populations and range restriction would have been further exacerbated by an increasing human population.

By the end of the Altithermal, the combined interaction between environmental and demographic variables is believed to have reduced the effectiveness of broad-spectrum foraging economies. This would have created a selective context favoring the development of subsistence and settlement systems with the ability to tolerate greater demands on subsistence resources within an increasingly restricted space. In the central Cascades, this stress may have been alleviated through the adoption of semisedentary foraging strategies.

Large, aggregated winter settlements are thought to have developed in the lowlands, especially in areas near streams and/or meadows with access to elk and deer winter ranges. Big game foraging would have continued to provide the primary subsistence base. Small-scale, increasingly task-specific hunting and/or plant collecting groups would have been the primary users of the uplands, fragmenting to different resource areas during the warmer months. Members of these upland parties are believed to have retained political and logistical affiliations with a larger social group that congregated at winter village sites during the cold seasons.

If big game hunting/foraging remained the primary upland emphasis, site locations should be similar to those of the earlier period. Particularly favorable places may be found on level saddles, benches, ridges, rockshelters near open meadows, water sources with good solar exposure and other areas offering access to upland resources. However, artifact assemblages should show an increasing reliance on task- specific tools and less emphasis on multifunctional items. The overall number of sites should also increase with the expansion of the regional population density.

(4) Intensive Semisedentary Foraging (ca. 2500 to 500 B.P.)

Essentially modern floral assemblages are thought to have taken hold in the central Cascades by this period. With the possible exception of temporary changes driven by short-term climatic or environmental fluctuations, the overall distribution and abundance of Douglas Fir, Western Hemlock and other characteristic high elevation plant and animal species were probably similar to those of today. If the model is correct, populations should have reached their maximum densities, leading to a maximum level of pressure on the region's available resources. Increased competition is believed to have compelled people to place even more emphasis on centralization processes begun during the previous period. New and more-effective technologies (eg., bow and arrow) and techniques oriented toward hunting smaller and/or more-elusive animals are also thought to have been developed. More contact, trade and conflict between socially-distinct groups may have been additional consequences of higher population concentrations.

In general, continual population growth served as the driving force behind most social and technical changes that occurred during this period. As the quantity, size and sociopolitical complexity of lowland settlements continued to increase, so should the numbers of people who ventured into the mountains. This intensification should be reflected in a higher frequency of upland archaeological sites in comparison to those dating to other periods. Hunting and foraging would have remained the principal activities, although more emphasis was being placed on variably-sized animals and plants from more-marginal areas. Archaeological assemblages are expected to primarily contain hunting-related artifacts, although greater stylistic and functional variation should be present due to more crossover between small and big game hunting parties from socially distinct groups. Likewise, sites may show an apparent increase in task variability if the search for lower return floral items became a more-routine adjunct to hunting.

(5) Post Apocalypse Strategies (ca. 500 B.P. to Present)

This period is characterized by unparalleled changes in aboriginal socioeconomic structures. Native populations living in the central Cascades came face-to-face with Euroamerican systems that often had radically different values and *modus operandi.* Traditional economies and social structures were either smothered, destroyed or forever altered. The abrupt decimation of local populations by European diseases ravaged native societies and destroyed elaborate social structures that had been established to help maintain the delicate balance between population density and resource availability. The subsequent and relentless incursion of industrial-based socioeconomic systems into the Pacific Northwest proved to be the proverbial final nail-in-the-coffin for the highly-adaptive native traditions of the central Cascades.

Viable indigenous economic systems never became reestablished because of a seemingly-endless barrage of pressures from outside sources. Interaction and competition with the expanding Euroamerican system led to social and economic dislocation, reliance on government subsidies and relocation to unfamiliar areas and reservations. As settlers, industries and federal agencies began to establish farms, logging, fishing and industrial-based operations in areas surrounding the central Cascades, the importance of hunting and other traditional forms of resource foraging was gradually reduced to the point where they became nonessential or largely recreational pursuits.

The rapid disintegration of populations due to epidemics implies that a dramatic decrease in overall montane site density should have occurred. Composite social groups reformed from remnant populations are believed to have continued their seasonal hunting and foraging pattern in the mountains when not congregated at their lowland winter settlements. However, the number of sites in both upland settings and lower areas should have dropped substantially. A limited number of highly-mobile residential groups not tied to lowland communities may have also roamed the uplands during this period, but their effect on overall site density is expected to have been negligible. In addition, migrations by an undetermined number of people to other regions more-suitable for pedestrian foraging, horse-based economies or trade with other groups may have helped to further reduce the number of very late prehistoric sites in the central Cascades.

The theoretical foundation for Burtchard's prehistoric framework is built on the assumptions that:

> 1) human populations have an intrinsic tendency toward increase until constrained by environmentally imposed resource limits; and 2) human population radiation and major changes in exploitative techniques, including social and technological change, are understood productively as

> adaptive responses to demographic pressure induced by population growth and/or resource degradation...(Burtchard 1991:15).

Burtchard points out that demands brought on by an ever-growing population meant that people had to continually readjust their cultural adaptive strategies to counter the "constant tendency toward disequilibrium" (1991:16). Ultimately, new patterns had to be developed to help alleviate stress brought on by resource overuse, increasing competition for space and natural changes in the environment.

Burtchard (1991:25) suggests that little attention has been given to broad areal or temporal syntheses of Cascades prehistory due to the the project-specific nature of most cultural resource funding during the past few decades. He contends that analysis of independent or specific prehistoric localities, especially those which had been used repeatedly over a lengthy period, should continue to provide important clues necessary for understanding the general processes and temporal land-use issues that affected the entire mountainous region. Although Burtchard appears to lay out a bold new approach to understanding past human use of the central Cascades, there has been far too little upland research and an insufficient collection of archaeological data at present to make a credible evaluation of the proposed model's utility, applicability and, ultimately, validity.

Chapter 5: PREVIOUS ARCHAEOLOGICAL WORK AT CRESCENT LAKE

Archaeological research has been conducted at Crescent Lake since the early-1980s. Unfortunately, most projects carried out prior to 1987 have gone unreported. Moreover, documentation from the earliest undertakings is very scattered, limited and difficult to interpret. Although 35KL749 has become the primary focus of archaeological investigations at Crescent Lake (i.e. primarily because of ongoing development and ground-disturbing activities at Crescent Lake Lodge Resort and the adjacent Crescent Lake Campground), additional prehistoric remains have been documented in a number of locations around the lake's perimeter. To gain a better understanding of how artifacts recovered at 35KL749 fit into the larger context of prehistoric use around the entire lake periphery, it is necessary to review the findings from other Crescent Lake sites and previous shoreline investigations. The results from these earlier studies are presented for comparison with materials and patterns observed at 35KL749.

Mountain Lakes Survey and Evaluative Test Excavation Project: 1982

The first in-depth study of Crescent Lake's archaeology occurred during the summer of 1982 (Snyder 1982a). Conducted in response to the Crescent Ranger District, Deschutes National Forest's plan to sell commercial timber in areas adjacent to Crescent, Davis and Odell Lakes, the project was designed to systematically inventory, document and evaluate the cultural significance of archaeological remains present in the district's high lake areas. The proposed sales were expected to affect a large portion of the shorelines and beach terraces around the three lakes, potentially disturbing a variety of unrecorded cultural resource sites. Results from the project would hopefully yield new information about prehistoric use of high mountain lake areas and help the Crescent Ranger District make more-informed cultural resource management decisions in the future. Unfortunately, the lack of time limited the investigations to only Crescent and Davis Lakes. Although a final report was never completed, a rough draft written for information purposes only was prepared and has been kept on file at the Crescent Ranger Station.

According to Snyder's August 24 (1982a:1-4) descriptions, a pedestrian survey and archaeological inventory was conducted around the perimeter of Crescent Lake between June 16 and July 6, 1982. While the investigation was generally confined to areas between the shoreline and roads paralleling the water's edge, the variable nature of the terrain played a critical role in determining the extent to which surface examinations could be conducted. Topographic features were inspected in areas where roads cross reasonably level terraces or the edges low-gradient slopes. By contrast, steeper slopes, especially those flanking the northwest shore, were not examined above the road. Several ridges, small rises, lakeshore flats, clearcuts and interior side roads located in the Umli area immediately east of the lake were also investigated for cultural material.

Regularly-spaced transects proved to be impractical due to dense vegetation cover and rugged topography in all areas except those which had been clearcut. Instead, soils found in road beds, cutbanks, animal trails, erosional gullies, root wads, rodent burrows and other exposed features were intensively examined. Surface soils in areas with standing timber were also investigated by removing the duff layer in 20-30 cm^2 plots. The lakeshore periphery, on the other hand, proved to be much easier to survey due to the minimal vegetation cover on the shoreline's sand and rocky beaches.

Results from Snyder's survey indicate there is a high correlation between gray sand concentrations along the lake's beaches and the occurrence of cultural materials. Eroded cutbanks and beach profiles at the water's edge indicate that remains of prehistoric occupations sandwiched between pumice layers have been exposed and eroded through ongoing wave action. The association of cultural materials with beach sands appears to have resulted from natural factors, particularly due to erosive "winnowing" action that has continually eaten away at landforms located at or below the high water mark.

Accordingly, repeated exposure to waves and water flow has caused pumice fragments to become dislodged and ferried away from their primary deposition points. When this occurs, volcanic salt and pepper crystals, artifacts, lithic debris and heavier materials are left in the same relative horizontal location, although they become concentrated vertically. Over time, layers of pumice, larger gravels and sands are redeposited along the lake's shoreline. Such erosional sorting has, over time, produced the gray sandy beaches that typically ring Crescent Lake's shoreline.

Therefore, Snyder concludes that ongoing hydrological and geological circumstances have dictated the vertical distribution of cultural materal near the lake's edge. Lithic debitage from the salt and pepper beach sands are contextually disassociated both vertically and horizontally, giving rise to a relatively continuous distribution of cultural material along large portions of the shoreline. Thus, traditional site designation criteria cannot be applied to lithic scatters found in the beach zone because of the lack of distinct site boundaries and stratigraphic control. Seven beach sites were identified, nevertheless, based on collection areas defined by topographic and/or recent cultural features. However, it is virtually impossible to link any beach material with cultural remains found in uneroded terraces and forested landforms located above the shoreline without subsurface testing.

Snyder also documented six prehistoric site locations above the high water level on several low terraces and around the mouth of Crescent Creek. Although the appearance of surface lithic scatters containing small amounts of stone tools and fragments allowed for the gross definition of horizontal site boundaries, the depth of buried components was not determined. Nevertheless, ongoing construction projects and recreational activities at the National Forest campgrounds, Crescent Lake Lodge Resort complex, Simax Bay access and Boy Scout Camp are believed to have distorted the contextual integrity of deposits to varying degrees at each location. Snyder recommends subsurface testing of relatively undisturbed soils near the sites to reveal the nature and extent of prehistoric occupations in each area.

Further investigations uncovered eight isolated finds. Three were found on the lakeshore and five were noted in the Umli area. The ground around each isolate was closely-inspected for additional cultural material but none was observed. Snyder notes the small quantity of material found is insufficient for evaluating lake settlement and utilization patterns away from the lake's periphery. Rather, a continuing program of pre- and post-project-specific surveys, coupled with additional examinations of clearcuts, spur roads and related features, may uncover more information which could be extremely useful in the construction of a prehistoric settlement model for Crescent Lake.

Snyder has proposed a topographic setting hierarchy that attempts to account for site intensities and frequencies observed during the 1982 survey (Fig. 10). The hierarchy is based on the premise that particular use patterns determined by variables such as weather, seasonality, resource focus and direction of approach may have been keyed to specific locations. If so, the nature of human use at the lake may be inferred through analysis of setting context and associated artifacts, both within a given site and on a comparative site-to-site basis. This is not to say, however, that any particular site or setting should be considered more important than others; groups that annually came to Crescent Lake may have frequented one or more sites in a number of settings, meaning that sites in all areas may offer unique, meaningful perspectives on the whole of local native life. According to July 30, 1982 rough draft notes, the following are considered key areas:

Bay/Creek Mouth Complexes:

These are considered the most-promising areas for locating archaeological remains. Snyder theorizes that fishing may have been the primary focus in such locations. Sites found at Simax Bay, Tranquil Cove and Tandy Bay are included in this category.

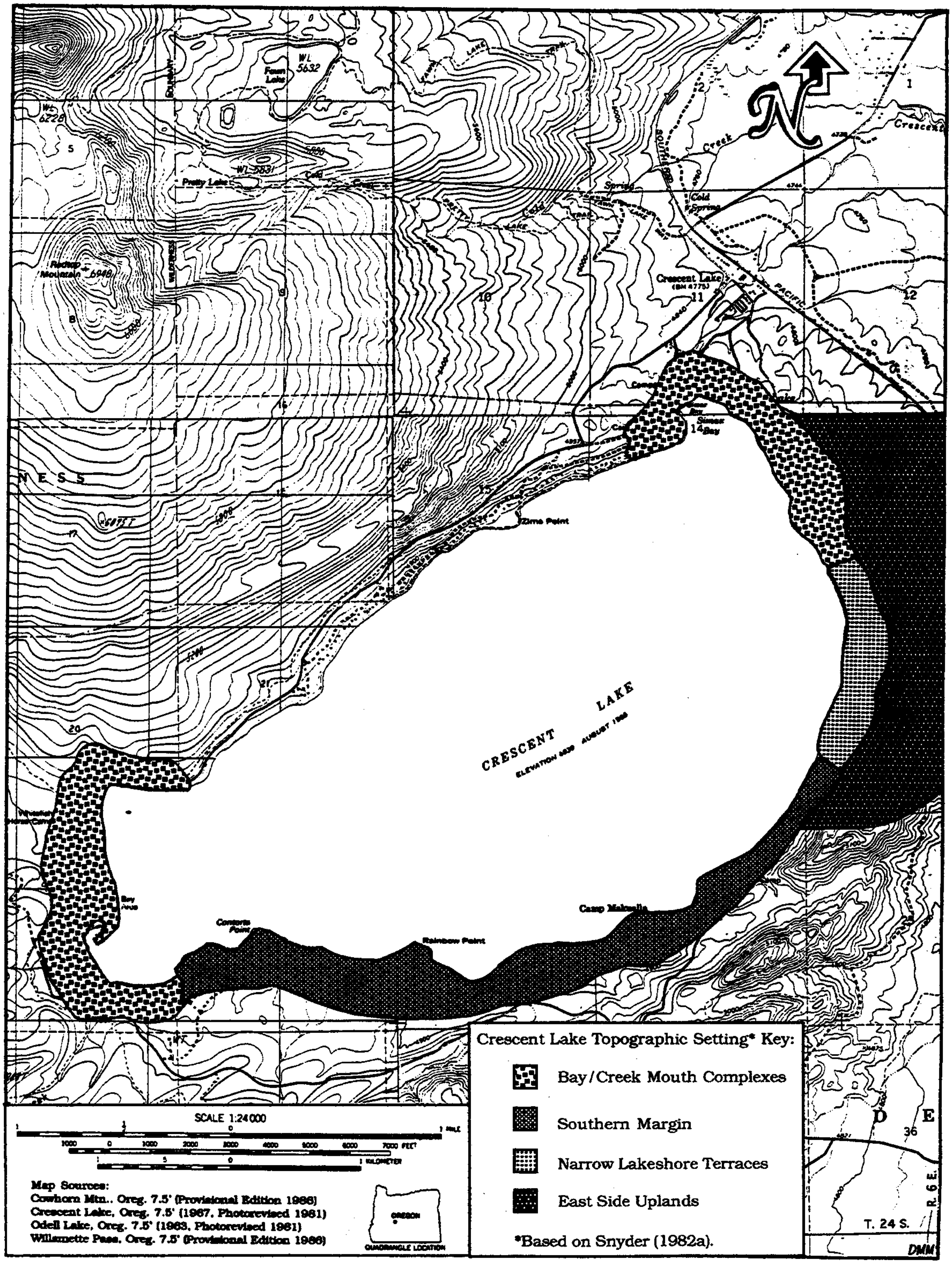

Fig. 10. Topographic setting hierarchy for Crescent Lake.

Crescent Lake's Southern Margin:

The comparatively extensive flats extending back from the water's edge appears to have supported a slightly-less intensive occupation. This is represented by a chain of sites that extends along the lake's southern perimeter between Spring Forest, Boy Scout Camp and Beach sites #2-4. No predominant activity is mentioned for this setting.

Narrow Lakeshore Terraces:

Less focus appears to have been placed on narrow lakeshore terraces bordered by sharply-rising slopes. Simax area lithic scatters such as Umli #1 and Beach sites #1, 5, 6 and 7 are located on representative examples. No predominant activity is mentioned for this setting.

East Side Uplands:

Isolated finds documented in the upland area east of Crescent Lake point toward a more-scattered, less-intensive use. Snyder suggests that hunting and gathering may have been the primary activities carried out in this setting.

In her August 24 (1982a:5-7) conclusion section, Snyder makes the following observations about Crescent Lake's archaeology and offers suggestions designed to help address future management concerns:

> 1. Pre-Mazama soils are buried under 3-4 feet of pumice in most cases so presence/absence of prehistoric site(s) prior to that deposition should not generally be a management concern. Exceptions might include:
>
>   a. Construction projects requiring excavation below the pumice (septic tanks, basements, etc.), and/or
>
>   b. More shallow soil disturbance in areas where, due to erosion or other factors, the pumice layer has been partially removed. Soil augers could be employed to determine the depth of buried soils; a test excavation would supply evidence concerning the presence and nature of pre-Mazama cultural materials.
>
>   Otherwise, Forest Service management will be involved with post-Mazama (after 6,800 B.P.) occupation of the lakeshore and associated areas. At present, results of the archaeological survey and relevant geological data

suggest that in more stable areas where flat terrain and vegetation have provided some degree of protection from frequent, large-scale soil and pumice movement, cultural materials will lie primarily within the upper 20 cm. or less. Subsurface testing will provide verification of this generalization, although exact depth will be variable from site to site. In other locations, particularly below the high water mark around the lakeshore, there tends to be a concentration of artifacts and lithic debris with the salt and pepper crystals deposited with the pumice and ash during the Mazama eruption. The "winnowing" process described above appears to offer the most acceptable explanation for the close correlation of artifacts and flakes with this distinctive soil type. This artifact-rich stratum may be either exposed or buried under redeposited pumice.

2. Another critical factor in attempting reconstruction of prehistoric settlement patterns and occupational chronology is the higher lake level resulting from dam construction on Crescent Creek. Informants have repeatedly related the practice of collecting artifacts during the fall draw-down. Such reports suggest the presence of both additional sites and extended boundaries for many of those located adjacent to above the current shoreline. Examination of topographic maps drawn prior to raising the water level could be most effective for interpreting the results of this survey project.

3. Collectors have depleted the number of diagnostic artifacts over the years. Most of this activity appears to be confined to (the) beach and draw-down zone, however, where the materials are exposed and highly visible. There seems to have been little or no subsurface collecting except in those locations which have been disturbed through construction activities. For this reason, it is quite possible that there are relatively undisturbed cultural deposits in forested areas above the high water cut bank. While perhaps not the main loci of prehistoric occupation at Crescent Lake, these areas are certainly important in constructing the basic, much needed temporal and cultural framework of prehistoric activity in the High Cascades in general and the Crescent Lake area in particular. Subsurface testing would probably be most effective in this type of site location.

   Future management recommendations may be based on results of both site location and subsurface evalution. A primary limiting factor in protection of any site, however, lies in the difficulty of accurately defining site boundaries due to poor surface visibility. In some cases a subsurface testing program may be necessary to establish adequate horizontal boundaries necessary for management purposes; in others, the terrain may provide natural limits.

Cultural Resource Inventory of Crescent Lake Shoreline: 1988

Lithic Analysts, under contract with the Forest Service's Crescent Ranger District/Deschutes National Forest, conducted another cultural resource inventory of the Crescent Lake shoreline in July, 1988 (Flenniken and Ozbun 1990a). The survey area encompassed the entire circumference of the lake in an approximately one-kilometer band above the shoreline. The purpose of the project was to investigate for unrecorded prehistoric and historic cultural resources in addition to revisiting the twelve sites previously documented, and, where possible, assess their eligibility for nomination to the National Register of Historic Places.

The survey was accomplished by conducting pedestrian transects spaced at 20-50-meter intervals. Terrain inspected within the project area included steep hillslopes, cliff tops and edges, wet marshlands, heavily vegetated areas and beaches. Potential site locations in areas adjacent to the lake and tributary streams were carefully inspected for cultural remains, and particular attention given to exposed or disturbed spots in road cutbanks, creek banks, treethrows and along the shoreline where buried deposits may have surfaced. Two 50 cm x 50 cm shovel probes were also excavated at two previously-recorded potential rockshelter sites (eg., 75 CRD 82, 76 CRD 82) to check for subsurface deposits .

During the project, many areas that may have been preferred during prehistoric times were also found to be favored and heavily-used by modern era Crescent Lake visitors (Flenniken and Osbun 1990a:16-17). Consequently, locations near coves, overlooking terraces, beaches, creek mouths and flat surfaces adjacent to the lake and tributary streams were judged as being either very disturbed or somehow altered from their original appearance. However, older and less-disturbed sites may exist in any number of these places but are probably buried below the 1.0-1.5 meters of Mazama tephra blanketing the entire Crescent Lake area. Sites located closer to the original shoreline may also be submerged due to past natural and artificial lake level fluctuations.

No unrecorded sites were discovered during the 1988 survey. The twelve previously-documented sites were revisited and their conditions were briefly assessed. Upon concluding that the entire area around Crescent Lake has been disturbed by modern activites, construction and lake level changes, the authors declare that the sparse amount of cultural material at the known sites and lack of new finds means that larger sites must now be submerged:

> The ten previously recorded archaeological sites... appear to form a prehistoric lake-use "pattern." This pattern creates a false impression of Crescent Lake prehistoric use. Based upon Lithic Analysts survey results, no separable prehistoric sites were located. Rather the entire lake shoreline can be best described as a very sparse lithic scatter (1-3 flakes per 100 linear meters of shoreline). These observations are well supported by the test excavations conducted by Snyder (1982). In other words, the Crescent Lake shoreline "sites" are no more than scattered artifacts associated with sites now underwater. Definition of ten separate sites around the lake creates an unrealistic impression of prehistoric lake use (Flenniken and Ozbun 1990a:18-19).

These conclusions are baseless and highly-speculative at best. Granted, any "pattern" derived from the meager remains found at the ten known sites would be conjectual and subject to revision as new sites, isolates and related information are found. However, the scattered nature of the lithics may be due to a combination of disturbances brought on by many years of natural erosion, modern recreation activities and ongoing development. In addition, the lack of diagnostic tools on the surface may be related in large part to collecting by artifact hunters who have scoured the lake in search of "good stuff".

Therefore, to blatently state that all lithic material on the shoreline is associated with larger "underwater" sites is simply ludicrous. No corroborating evidence is given to support this claim, and, without such evidence, it is just as reasonable to claim that the shoreline debitage is related to unseen, heavily-vegetated sites found above the shoreline. Similarly, the 43 artifacts recovered by Snyder (1982a:10/20 rough draft notes, pp. 1-18) from test units placed along

Crescent Lake's southern perimeter *only* suggest that prehistoric use in those particular areas may have been light, rather than lending credence to the speculation that they are fringing remnants of larger, *submerged* sites. Although an unknown number of prehistoric sites were likely flooded as the lake level was raised, it is extremely presumptious to connect them with known cultural materials given that no underwater investigations have been carried out.

Finally, the lumping of all lithic artifacts found around Crescent Lake into one site is absurd from a cultural resource management standpoint. Although most areas around the lake were likely used by native peoples at one time or another, selected locations were probably favored over others through time. Unfortunately, the complex and sometimes distorted nature of the terrain often makes designation of boundaries between individual sites extremely difficult. However, the Forest Service must continue to find ways to best protect the lake's archaeological resources in the face of the area's continual heavy use by recreationists, developers and timber interests. Given this ongoing management conflict, present circumstances dictate that every attempt be made to distinguish individual site locations so that measures can be taken to preserve the lake's overall historic integrity. Thus, it is a very impractical use of the "site" concept to label the entire shoreline as a single cultural manifestation.

Overview of Documented Sites at Crescent Lake

The following is a brief description of all documented sites (excluding 35KL749) located around the perimeter of Crescent Lake (Fig. 11). To date, 16 sites have been recorded. For purposes of site location confidentiality, exact locational information is not included. Also, isolated finds found in the vicinity of the lake are not discussed due to their scattered nature.

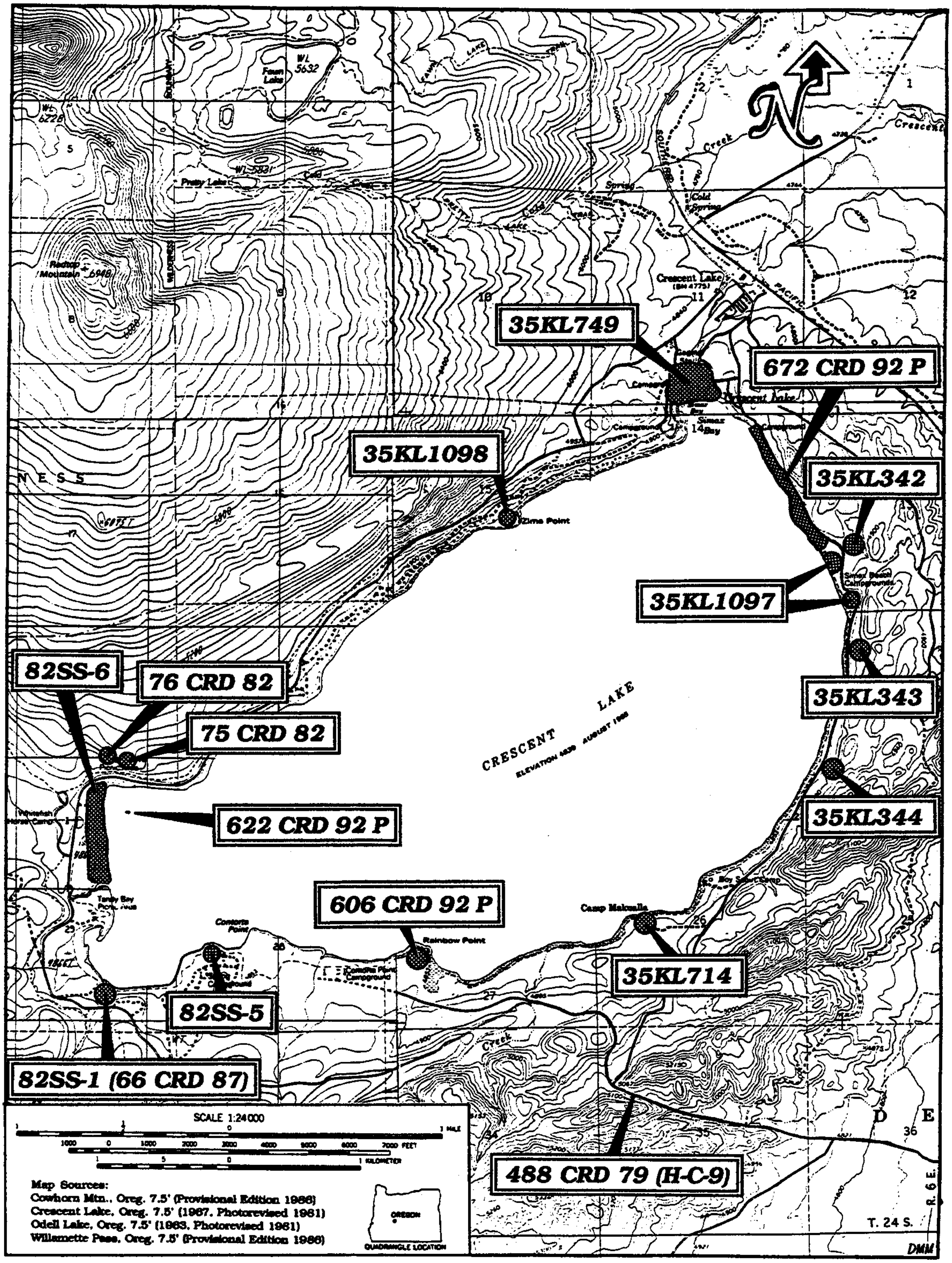

Fig. 11. Locations of documented archaeological sites at Crescent Lake.

35KL342 (North Simax Beach Site):

This site is located on a relatively-level saddle between North Simax Beach and Road 6015-137 (Hickerson 1992). The site was originally documented in 1982 as a 150 m x 80 m lithic scatter extending between the northernmost area of Simax Beach and several spur roads located immediately northeast. In 1991, 21 obsidian flakes (eg., three late stage bifacial thinning and 11 pressure) spread over a roughly 10 m x 7 m area were located and plotted. Although one large biface was found in 1982, no formed tools were observed during the 1991 resurvey. The debris has been interpreted as the remains of a late prehistoric tool reuse area or possibly a seasonal campsite.

Ten 1 m x 1 m test units were also excavated within a small lodgepole flat located less than 0.25 mile east of the main portion of Simax Beach (Snyder 1982a:10/20 rough draft notes, pp. 2-3). Each unit was excavated to a depth of between 20-60 cm. Only two units produced a total of three flakes, all found within 10 cm of the surface. The unit wall profiles indicated the area's natural stratigraphy has been somewhat distorted by a combination of natural mixing, erosion, root growth and recent human activities.

672 CRD 92 P (Simax Peeled Ponderosa Pines):

This site consists of approximately 15 acres of intentionally-peeled, semi-old growth Ponderosa trees located just above the shoreline of Simax Beach (Steece 1992a). The trees are in varying stages of decay and display variable signs of modern damage and natural healing. The dates of use have been estimated to around 150 years ago.

35KL1097 (Simax Beaches):

This large site covers a 510 m x 95 m area on the gentle slope leading down to Simax Beach (Steece 1992b). Two loci have been recorded in lag beach deposits at the edge of Crescent Lake. Clusters of bifacial thinning flakes and other reduction debitage have been found in both portions of the site. Obsidian accounts for the vast majority of the cultural material, with smaller amounts of cherts and basalt. Many of the flakes appear water worn. In addition to recovering several projectile points (eg., stemmed, side-notched and flat-based) from the scatter, a large vesicular basalt bowl with a jagged-edged hole in the base was also found during a stump removal project. Soils and artifacts at the site have been heavily-mixed and displaced due to years of natural erosion, water level changes and various human-caused disturbances.

35KL343 (Camp Site #1 -- Umli Unit #2):

This 40 m x 20 m lithic scatter lies on a narrow, eroding terrace overlooking lower Simax Beach (Snyder 1982d). A few obsidian flakes and one stemmed projectile point were noted, but no features were found. Erosion caused by the elevated water level, extensive logging and use of an adjacent unimproved road has greatly disturbed the site. The site's date of use has been estimated to the Late Archaic on the basis of the stemmed dart point style.

Three 1 m x 1 m test units were also excavated at the site (Snyder 1982a:10/20 rough draft notes, p. 4). Unit A produced five obsidian waste flakes in the upper 45 cm. However, mixed soils observed in the wall profile suggest the lithics were displaced from their original context. Units B and C were excavated to depths of 30 cm and 40 cm, respectively, but no cultural material was found. Results from the excavations suggest that logging, road grading and lake terrace erosion have disrupted the internal integrity of the cultural deposits and reduced the original site area. Nevertheless, less-disturbed remnants may still exist in nearby standing timber areas.

35KL344 (Beach Terrace Site #4 -- Umli Unit #3):

Approximately three acres of obsidian debitage is scattered atop a terrace overlooking an eastside beach of Crescent Lake (Snyder 1982e). Few diagnostic tools have been found, although one Rose Spring projectile point has been used to date the site to late prehistoric times. Most of the terrace appears to have eroded into the lake due to water level changes, possibly accounting for some of the lithic material found scattered across the beach. Logging and road construction through the site have also heavily impacted the area.

Eleven test units spaced at roughly 0.1 mile intervals were excavated between 35KL344 and 35KL714 (Snyder 1982a:10/20 rough draft notes, pp. 5-8). Although the total artifact quantity was extremely limited, the following items were recovered:

Beach Terrace #1: A single test unit yielded one worked obsidian flake in the 10-20 cm level. A weathered, crudely-formed obsidian point was also collected from a nearby road.

Beach Terrace #2: Cultural material was found in only one of the two test units. Five obsidian thinning flakes and one uniface were found in the upper 30 cm.

Beach Terrace #3: One obsidian thinning flake was recovered from one unit.

Beach Terrace #4: 29 obsidian waste flakes were found in the upper 40 cm of one unit, with nearly 60 percent of the material being concentrated in the 10-20 cm level. A single steel bolt found in the same level also suggests the immediate area has been recently disturbed to at least a shallow depth.

The remaining test units revealed a total of four obsidian flakes, each coming from depths of between 15-20 cm.

35KL714 (Boy Scout Camp):

Originally documented in 1982, this moderately-heavy concentration of flakes is scattered in beach sands and around the buildings on the low, flat lakeshore benches that form the grounds of the Boy Scout Camp (Cassidy 1994). Most of the debitage was found on the beach, with lesser amounts seen around the camp buildings. Although most debitage consists of obsidian, one red chert and several fine-grained basalt flakes were also found. The lighter distribution found around the buildings in comparison to that seen on the beach may be partly due to greater collecting in the camping areas.

606 CRD 92 P (Rainbow Point):

This 30 m x 30 m lithic scatter is strewn across a gently-rolling beach terrace at Rainbow Point (Cassidy 1992a). Flake material at the site consists of red and green cherts, gray to black obsidian and fine-grained basalt. Diagnostic artifacts observed include a large, conical-shaped, pecked basalt maul/pestle, one unidentified projectile point lateral edge fragment, one obsidian biface base and a small obsidian, unifacially-worked flake. The site has been slightly disturbed by recreational activities.

82SS-5 (Spring Forest Campground Site):

Flakes have been found scattered between Spring Forest Campground and the nearby beach area (Snyder 1982b). Most of the material in the approximately 100 m x 50 m site is concentrated on the beach near a high water cut bank that trends along a rounded point. No other information about the artifacts has been recorded.

82SS-1 (66 CRD 87 -- Tandy Bay Site):

This 228 m x 284 m site extends along the lakeshore terrace located in Tandy Bay Campground (Davis and Snyder 1982; Bennett 1987b). Five major concentration areas have been identified, each characterized primarily by obsidian flakes and smaller amounts of chert debitage. The 1989 resurvey documented no discrete artifact concentrations, although greater amounts of debitage were observed in higher locations (Flenniken and Ozbun 1990b:26). Scattered lithics extend into the lake, suggesting that a portion of the site has been inundated. One metate fragment, a unifacially-retouched flake, an obsidian biface fragment, one unidentified obsidian projectile point and fire-cracked rock fragments suggest the site was used as a seasonal prehistoric camping area. The condition of the site ranges from fair to extremely poor, depending on which locations are being examined. Similarly, some spots in dry or exposed areas may have been heavily picked over by artifact collectors.

82SS-6 (Tranquil Cove Site):

Flakes and lithic artifacts have been observed along the lake margin between Whitefish Creek and Tranquil Cove (Snyder 1982c). No artifact descriptions have been documented for this site. Collectors have scoured this area for years and have likely gathered many diagnostic tools and debitage that originally existed at the site. Additionally, areas around Whitefish Creek have been logged and filled, changing the prehistoric arrangement of that part of the beach and adjacent forested bench.

622 CRD 92 P (U.S.S. Klamath):

This site is located on an island in Tranquil Cove near the southwest end of Crescent Lake (Ball et al. 1992). Numerous lithics are scattered over a 135 m x 130 m area of the island. During prehistoric times and recent prolonged drought periods, the island was exposed as a peninsula connected to the shoreline. No artifact descriptions have been documented for this site. However, recent vehicular activity has partially-damaged the site and extensive collecting (especially during years of greater-than-normal surface exposure) has distorted the original surface archaeological record.

76 CRD 82 (Tranquil Cove Rock Shelter -- Site 1):

This two-opening rock shelter is located northwest of Tranquil Cove on a moderately-steep, uneven hillslope outcrop (Steece 1982b). One opening exhibits minor vandalism (i.e. digging in floor) and the other has naturally caved-in. A single 50 cm x 50 cm shovel probe was excavated to a depth of 30 cm, but no artifacts were unearthed (Flenniken and Ozbun 1990b:21). Although no cultural material has been found in or near the shelter, the location appears to have offered high potential for use during the prehistoric period.

75 CRD 82 (Tranquil Cove Rock Shelter -- Site 2):

This possible shelter is located approximately 450 meters east of 76 CRD 82 on similarly steep, rocky outcrop-clad terrain (Steece 1982a). No cultural material has been observed in or near the cave opening. A single 50 cm x 50 cm shovel probe excavated to a depth of 10 cm uncovered no artifacts (Flenniken and Ozbun 1990b:17). The shelter appears to be in excellent condition.

35KL1098 (Zims Point Site):

Formerly designated 629 CRD 92 P, this light concentration of lithic debris is scattered across a 100 m x 175 m area on Zims Point (Cassidy 1992b). A total of 18 bifacial thinning flakes, two projectile points (one with a distal end impact fracture) and a possible unifacial knife were observed along the beach on the north end of Zims Point. The densest concentration was observed near the shoreline cut bank. Fluctuating water levels have likely affected exposure and burial of the site's cultural material. Likewise, ground disturbances at nearby summer home residences and collecting by recreationists have probably impacted the site to an unknown degree.

488 CRD 79 (Elliott Wagon Train Route):

Wagon wheel ruts marking the 1853-1860s era Elliott Wagon Road can still be seen in selected locations from the junction of Crescent Creek with Big Marsh Creek to the southwest side of Crescent Lake (Dudley 1979). However, much of route was altered or replaced by the later Oregon Central Military Wagon Road and present Forest Service Road 244.

In summary, most documented sites at Crescent Lake have been found in beach and near-shoreline contexts. Most investigations have been focused near shoreline areas primarily because that is where most development and recreation activities have and continue to take place. Consequently, that is where cultural resources are most at risk. Such locations have also seen the highest rate of continual erosion and human-caused disturbances. Thus, it is no wonder that surface and shallow deposits in these areas exhibit varying degrees of impact and disorder.

Nevertheless, it is evident from lithic remains found at these sites that groups of people visited Crescent Lake's perimeter during prehistoric times to conduct a variety of short-term, seasonal activities. Hunting, tool manufacture and rejuvenation, hide preparation, plant food processing and camping were particularly conspicuous pursuits. Other related activities may have taken place, but additional cultural material must first be unearthed before comments can be made about their nature.

Chapter 6: *35KL749 METHODOLOGY*

As mentioned in the previous chapter, most archaeological work conducted at 35KL749 prior to 1987 consisted of brief, small-scale projects that were inadequately documented. Moreover, many of the artifacts recovered during earlier projects have been misplaced. Therefore, this discussion will primarily focus on investigations carried out between 1987-1991. Field procedures followed during each project and analytic techniques used to examine the site and recovered artifacts are presented and reviewed. A new site map showing the distribution of all excavation units, recreational facilities and associated structures within 35KL749 has also been produced (Fig. 12).

(Note: Definitive site boundaries have not been designated for 35KL749 because such perimeters have not been adequately assessed and determined. The site's 14-acre size designation was determined by the Forest Service based on the apparent *horizontal* extent of lithic material scattered across the surface; whether the site is truly one large cultural manifestation or a number of smaller, overlapping use areas has yet to be resolved. For these reasons, the 14-acre dimension will be accepted until proven otherwise).

Field Methodology

Pre-1987 Investigations

As early as 1982, a diffuse lithic scatter covering approximately 6.5 acres had been identified as extending along Crescent Lake's northern shore in the general location of Crescent Lake Lodge Resort to the eastern bank of Crescent Creek (Steece, personal communication). Originally designated 61 CRD 82, the site was characterized primarily by obsidian flakes and lesser amounts of cryptocrystalline silica and basalt debitage. Several obsidian tool fragments, ground stone and fragmented projectile points were also observed. Although the surface concentration

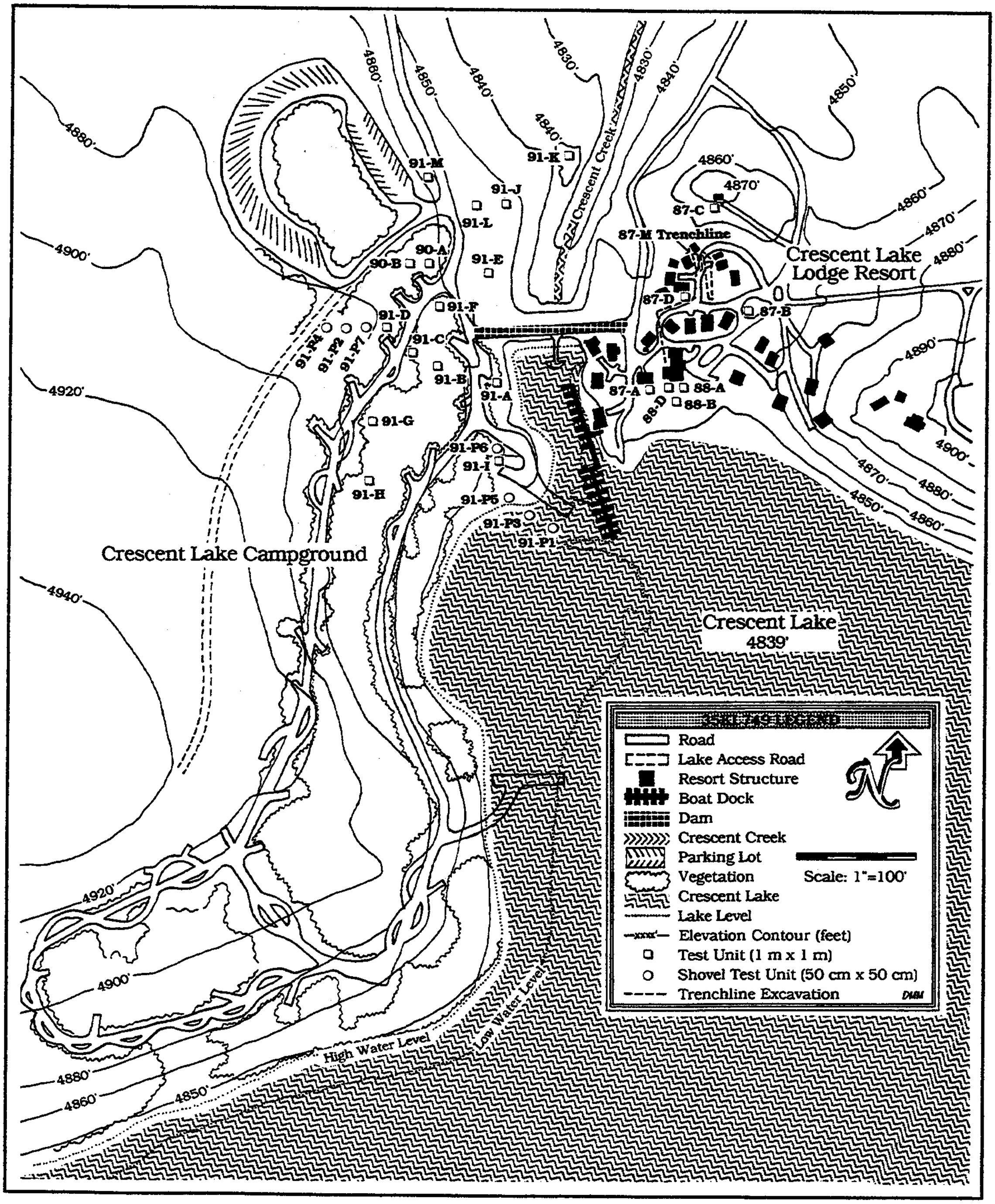

Fig. 12. Distribution of excavation units within the Crescent Lake Site (35KL749).

appeared to be light, little was known about how impacts caused by years of collecting, wave action erosion along the shoreline and construction at Crescent Lake Lodge Resort and the adjacent dam had affected the distribution.

The first evidence of a subsurface component was noted during a 1986 emergency septic tank excavation monitoring project on the grounds of Crescent Lake Lodge Resort (Steece, personal communication). Unfortunately, little information was recorded during the project and no artifact provenience data has been found. Likewise, all collected items have apparently been misplaced. The only available information is a sketch map showing the general location of the backhoe trenchline and several recovered artifact drawings (Steece 1986).

Based on available project records, the following artifacts were found on the surface near the excavation:

(2) complete, hand-size pestles;
(2) small pestle midsection fragments;
(1) fractured pestle side fragment;
(1) small side-notched projectile point;
(1) small, unfinished corner-notched projectile point;
(2) undetermined projectile point tips (one unfinished);
(1) small, unfinished projectile point base;
(1) large bifacial thinning flake with one retouched edge;
(4) bifacial thinning flakes; and
(1) small brass belt buckle.

In addition, 15 opaque-to-translucent gray obsidian bifacial thinning flakes were seen at the interface between the Mazama pumice and glacial till. A small amount of charcoal was also collected from the same location, but none has been radiometrically-dated. After the investigation was completed, the site was redesignated 61 CRD 86.

1987 Investigations

Crescent Lake Lodge Resort Monitoring (May 26-29, 1987)

In response to a proposal for a septic system replacement at Crescent Lake Lodge Resort, a subsurface testing program was initiated on the resort grounds between the northern shore of Crescent Lake and the eastern bank of the Crescent

Creek outlet (Bennett 1987a). The investigation's Principal Investigator was Jill Osborn, Deschutes National Forest Archaeologist, and the field work was supervised by Ann C. Bennett, Crescent Ranger District Archaeologist. No other information detailing the project's participants has been found.

The testing project was designed to:

1) determine whether subsurface cultural deposits are present within the area occupied by Crescent Lake Lodge Resort;

2) determine the nature, depth and horizontal extent of *in situ* cultural deposits; and

3) recover cultural material in a manner that would allow locations and significance to be recorded and assessed, insuring that provenience information will remain available even if future construction or ground-disturbing activities damage or destroy the area.

Field Methods:

Although no field notes and other records taken during the excavations have been found, the following standard field methods were used:

1. Four 1 m x 1 m test excavation units were excavated in four randomly-chosen locations (eg., one unit per location) on the grounds of Crescent Lake Lodge Resort. The units were designated 87-A, 87-B, 87-C, 87-D. Vertical provenience was maintained with line levels, transits and stadia. All test units were excavated in arbitrary 10 cm levels. All excavated material was screened through 6 mm (1/4-inch) mesh. No information is available on how deep each test unit was to be excavated, although it appears to have been left to the excavators' discretion.

2. *In situ* cultural deposits were collected and placed with provenience information in plastic bags for laboratory analysis. Several artifacts found on the surface in various areas near the resort were also collected and bagged with no locational information. These items were designated 87-O.

3. A rough sketch map showing the general location and provenience of each test unit in relation to Crescent Lake Lodge Resort structures was produced.

4. A Soils and Geomorphology Report (Brock 1987) containing stratigraphic profile maps and geomorphic information about each test unit was produced (eg., see Appendix 8).

5. A report of the project's findings (Bennett 1987a) indicates that photographs of each test unit and recovered artifacts were taken, but none have been been found.

Emergency Septic System Replacement at Crescent Lake (August 6, 1987)

An emergency monitoring operation was initiated when Crescent Lake Lodge Resort's original septic system failed and had to be replaced (Bennett 1987a). The project involved the installation of a new septic tank, drain field and connective piping. The field work was supervised by Ann C. Bennett, Crescent Ranger District Archaeologist. No other information detailing who participated in the project has been found.

Field Methods:

Monitoring activities consisted of observing all ground-disturbing activities connected with the construction of the new septic system. Ground disturbances were primarily caused by backhoe trenching and hand shoveling. Rather than sifting controlled samples of excavated soil through wire mesh screens, a "grab sample" approach was employed. This involved 1) searching for and collecting cultural material as excavated soil was dumped from the backhoe bucket; 2) sorting through backdirt piles; and 3) monitoring backfilling operations. Provenience was maintained by relating recovery locations to the septic system layout. All recovered artifacts were bagged and retained for laboratory analysis.

Unfortunately, no field notes have been found and only a few crude sketch maps of the project area were produced (see Bennett 1987a). Consequently, precise locations and dimensions of the trenches and shovel tests cannot be determined. Provenience information provided with each collected artifact is similarly vague and cannot be tied to any specific location on the site map. All recovered items were assigned an "87-M" designation and classified only as coming from an unspecified surface, backfill or unknown location. Therefore, it is impossible to pinpoint the location of any curated finds beyond stating that all came from within the confines of the Crescent Lake Lodge Resort trenching area.

Although a brief artifact catalog is provided with the project report, correlations between the listed items and curated artifacts cannot be made due to the objects' general nature and lack of labeling. Nevertheless, a listing of the documented artifacts is presented in Table 4 for information purposes only (see attached maps in Bennett 1987a for provenience).

1988 Investigations

Crescent Lake Lodge Resort Testing Project (September 22-24, 1988)

A new site report was prepared in July, 1988 after a surface survey revealed that a nearly-continuous scatter of cultural material extended beyond Crescent Lake Lodge Resort into the seasonal Forest Service campground immediately west of the Crescent Creek outlet (Goodman 1988). The site was estimated to span horizontally across approximately 14 surface acres, occupying 7.5 acres of the campground and 6.5 acres of the resort area. Two separate cultural components were identified: Component I consisted of a post-Mazama surface manifestation characterized by a moderate-sized scatter of approximately 10,000+ flakes, several projectile point fragments, ground stone and other stone tools; evidence for Component II was found during the 1986 emergency septic tank replacement project when waste debitage typical of biface manufacture was observed at the interface between 6800 B.P. Mazama pumice deposits and glacial till debris.

After documenting the apparent surface extent of the site, a Phase I evaluation project was carried out prior to the construction of a dining room deck addition at Crescent Lake Lodge Resort. The purpose for testing the site was to:

Table 4. Listing of unlabeled artifacts recovered at Crescent Lake Lodge Resort during the August 6, 1987 Emergency Septic System Replacement project.

Artifact Description	Provenience
(1) Slab metate	Unknown
(9) Obsidian flakes	Roadway surface by drainfield
(1) Obsidian angular fragment	Roadway surface by drainfield
(1) Basalt chopper	Septic tank area (north side of Cabin 14)
(8) Obsidian flakes	Septic tank area (north side of Cabin 14)
(1) Basalt unshaped mano	Backfill by Cabin 9
(7) Obsidian points	Backfill by Cabin 9
(4) Obsidian flakes	Drainfield line 2
(1) Cryptocrystalline silica flake	Drainfield line 2
(1) Obsidian biface fragment	East side of Cabin 9
(1) Obsidian flake	East side of Cabin 9
(1) Obsidian scraper	Stump removal area 1
(6) Obsidian flakes	Drainfield line 3
(1) Obsidian flake	Backhoe test 1, possibly pre-Mazama
(4) Obsidian flakes	Dam disturbed area
(6) Obsidian flakes	Drainfield surface
(1) Obsidian biface/knife fragment	Surface north of drainfield
(1) Obsidian flake	Surface north of drainfield
(1) Obsidian biface blank	South side of Cabin 9
(4) Obsidian flakes	South side of Cabin 9
(1) Obsidian core fragment	South side of Cabin 9
(1) Obsidian retouched blade frag.	Backfill by Cabin 9
(1) Basalt flake	Drainfield line 1
(11) Obsidian flakes	Drainfield line 1
(1) Obsidian angular fragment	Drainfield line 1
(1) Basalt flake	East side of Cabin 9
(11) Obsidian flakes	East side of Cabin 9
(10) Obsidian flakes	South edge of drainfield
(1) Obsidian flake	Septic tank area surface (north of Cabin 14)
(1) Obsidian flake	Stump removal area 2 (east side of Cabin 5)
(1) Obsidian Rosespring proj. point	Surface near test unit 87-C

1) determine whether subsurface cultural deposits are present in the location of the proposed deck;

2) determine the nature, depth and horizontal extent of *in situ* cultural deposits;

3) evaluate the scientific value of the archaeological material in order to determine the site's potential eligibility for listing on the National Register of Historic Places; and

4) help make recommendations for better management of the site.

The project's Principal Investigator was H. Scott Goodman, Crescent Ranger District Archaeologist, and the excavations were conducted by seven archaeologists, archaeological technicians and cultural resource technicians from the Crescent Ranger District.

Field Methods:

The following standard field techniques were used during the 1988 test excavations:

1. Three 1 m x 1 m test excavation units were excavated in the proposed location of the deck construction to determine the nature and extent of cultural deposits. The units were designated 88-A, 88-B and 88-D. Vertical provenience was maintained by excavating in arbitrary 10 cm levels. All excavated material was screened through 3 mm (1/8-inch) mesh. All test units were placed within the confines of the area to be disturbed or impacted by the deck addition construction. Each was to be excavated to a depth of two arbitrary 10 cm levels below the interface of cultural materials and culturally-sterile soil; however, it appears that the final depth of each test unit was left to the Principal Investigator's discretion.

2. *In situ* cultural deposits were collected and placed in plastic bags for laboratory analysis. Provenience information was also included with the bagged artifacts.

3. Stratigraphic profile maps of each test unit were drawn.

4. A site map showing the provenience of the test units in relation to the site datum and Crescent Lake Lodge was produced.

5. Photographs of the site and test units were produced.

6. A final project report was never completed.

1990 Investigations

Crescent Lake Site 35KL749 Testing (July 18-23, 1990)

A limited testing project was initiated near the western edge of 35KL749 after the Forest Service proposed to place a septic tank, drain field and buried power line in the Camp Host area of Crescent Lake Campground (Clark 1990; Steece, personal communication). This was the first subsurface investigation conducted on the west side of the lake's drainage outlet. The project was designed to:

1) determine whether the site extends west of Crescent Creek, with specific focus on the Camp Host area of Crescent Lake Campground where the Forest Service's new septic system was to be installed;

2) determine the nature, depth and horizontal extent of *in situ* cultural deposits; and

3) recover cultural materials in a manner that would allow their locations and significance to be recorded and assessed, insuring that archaeological information will be available prior to future construction or ground-disturbing activities in the area.

The project's Principal Investigator was Linda Clark, Deschutes National Forest Archaeologist. The field work was conducted by four archaeologists and cultural resource technicians from the Crescent Ranger District.

Field Methods:

The following standard field methods were used during the 1990 test excavations:

1. Two 1 m x 1 m test units were placed within the Camp Host area immediately north of campsite #1. The units were designated 90-A and 90-B. Bearings recorded on two vague sketch maps denote the locations of both units in relation to a fence post datum postioned at the southeast corner of the campground boat ramp (eg., from the fence post, the southeast corner of 90-A is located 60.8 m away at 327°; from there, the southeast corner of 90-B is located 13.7 m away at 292°).

2. Vertical provenience was maintained by excavating in arbitrary 10 cm levels. All excavated material from the upper four levels was screened through 3 mm (1/8-inch) mesh; 6 mm (1/4-inch) mesh was used for the remaining 12 levels. Each test unit was excavated to a depth of 156 cm below unit datum level to the glacial till horizon.

3. *In situ* cultural deposits were collected and placed in plastic bags for laboratory analysis. Provenience information was also included with the bagged artifacts.

4. Stratigraphic profile maps of each test unit were drawn.

5. Two rough sketch maps showing the provenience of the test units in relation to structures in Crescent Lake Campground were produced.

6. Although a photo log indicates that photographs of the test units were taken, none have been found.

7. A final project report was not written.

1991 Investigations

Crescent Lake Passport In Time Project (July 12-14; August 9-11; September 13-17)

The discovery of buried cultural material on the west side of 35KL749 during the 1990 excavations demonstrated the need for further subsurface testing within Crescent Lake Campground. In an effort to more-fully understand the vertical and horizontal extent of the site's deposits, test excavations were conducted during the summer of 1991 as part of the Forest Service's "Passport In Time" program. The project employed 54 volunteers and was supervised by archaeologists and cultural resource technicians from several Deschutes National Forest Ranger Districts. The project's Principal Investigator was Linda Clark, Deschutes National Forest Archaeologist.

The testing program was specifically designed to:

1) provide a better understanding of 35KL749's subsurface manifestations within Crescent Lake Campground;

2) determine the nature, depth and horizontal extent of *in situ* cultural deposits;

3) recover cultural materials in a manner that would allow their locations and significance to be recorded and assessed before future recreational, construction and ground-disturbing activities further distort the site's archaeological record; and

4) provide enough information that would allow for the development of a management plan that could be used by the Forest Service to help direct future work at the site.

Field Methods:

The following standard field methods were followed during the 1991 test excavations:

1. Thirteen 1 m x 1 m test units (eg., 91-A, 91-B, 91-C, 91-D, 91-E, 91-F, 91-G, 91-H, 91-I, 91-J, 91-K, 91-L and 91-M) and seven 50 cm x 50 cm shovel test units (eg., 91-P1, 91-P2, 91-P3, 91-P4, 91-P5, 91-P6, 91-P7) were excavated. All units were randomly-spaced along geomorphic features in order to test the site's horizontal boundaries. Subsurface tests were distributed along the forested terrace above Crescent Creek's west bank, on the Cresent Lake shoreline near the boat ramp and in various locations within the campground.

2. Each test unit was excavated in arbitrary 10 cm levels. Vertical provenience was maintained with line levels, transits and stadia. Shovels, trowels, whisk brooms, dust pans and buckets were used to remove the soil. All excavated

material was screened through 3 mm (1/8-inch) mesh screens. Although most test units were excavated until glacial till was encountered, a few were terminated at shallower depths when deemed appropriate by the Principal Investigator.

3. All cultural, faunal and floral remains were collected and placed in separate plastic bags for laboratory analysis. Provenience information detailing unit, level, mesh size and artifact descriptions were also included.

4. Level forms and field notes detailing stratigraphic and artifact information were filled out for each test unit.

5. Stratigraphic profile maps of each test unit were drawn.

6. A digitized topographic map of of the excavation areas within Crescent Lake Campground was produced based on geodimeter survey information (Fig. 13). The map superimposes a contour grid generated from topographic traverse data over the locations of all 1990 and 1991 test units, site datums and access roads within Crescent Lake Campground (De Santis 1995).

7. Photographs of all test units and surrounding site features were produced.

8. A final project report was never completed.

Analytic Methodology

After the 1991 excavations were completed, all artifacts and samples recovered from 35KL749 were stored at the Deschutes National Forest Supervisor's Office in Bend, Oregon. A preliminary examination of the archaeological materials was conducted, but budget constraints and limited personnel precluded more in-depth studies. The items were eventually transferred to the Crescent Ranger District in Crescent, Oregon where they remained until being loaned to Oregon State University's Department of Anthropology in 1994. All artifact analyses were conducted at OSU's Archaeology Laboratory in Corvallis, Oregon. Several specialized analyses were also performed by outside facilities when advanced techniques were required.

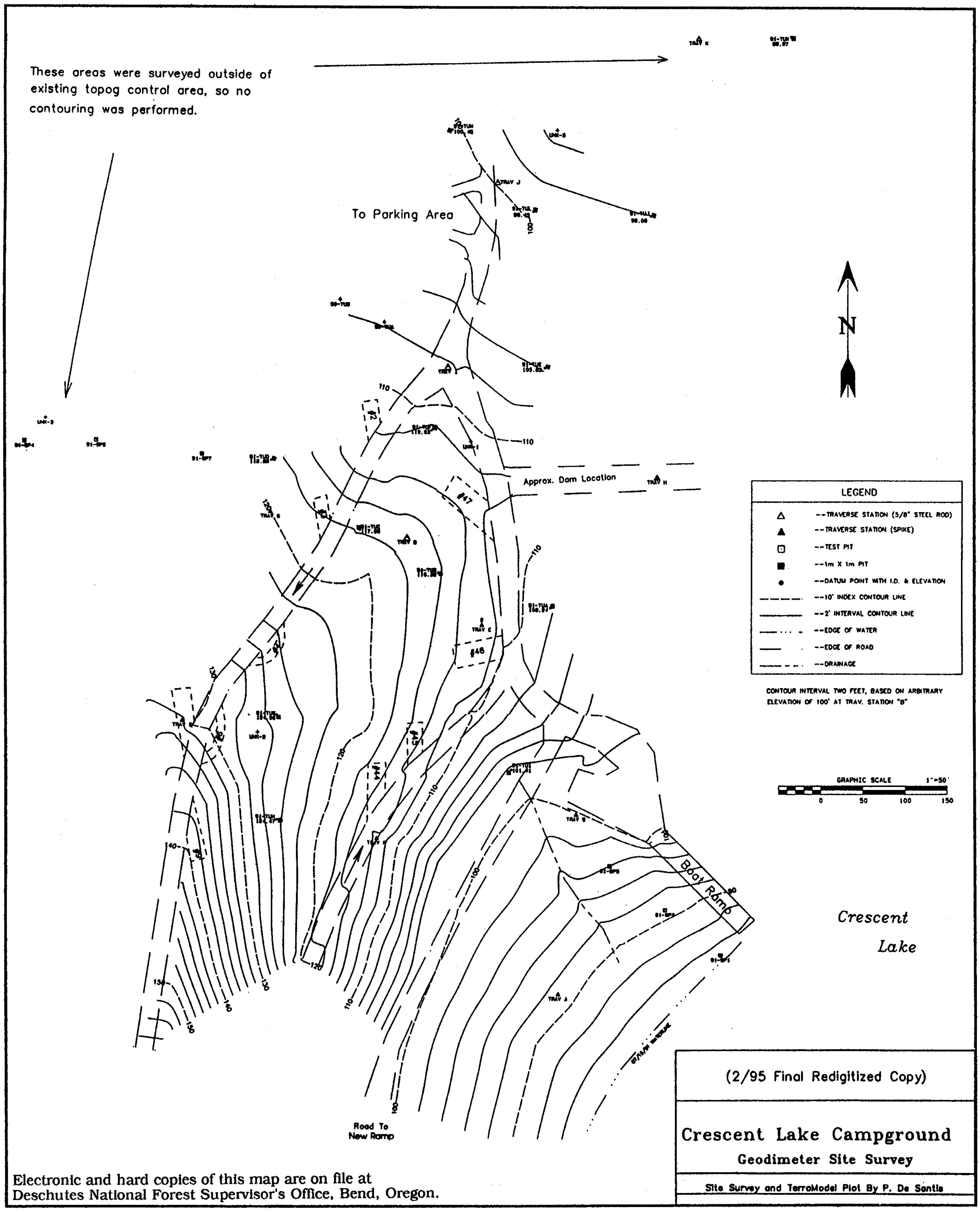

Fig. 13. Geodimetric map of 1990-1991 excavation areas within Crescent Lake Campground.

Laboratory procedures followed during the analysis phase were designed to achieve the following:

1) compile appropriate measurements and morphological descriptions of each artifact;

2) examine each artifact for evidence of use;

3) examine each artifact for morphological attributes which may help explain how they were produced and used;

4) maintain artifact integrity through appropriate handling and by maintaining a secure curation environment;

5) maintain accurate provenience information through detailed labeling and cataloging practices; and

6) furnish analysis results which can be compared to other archaeological data from the Cascade Range and adjacent regions.

After transferring the Crescent Lake materials to OSU, all artifacts received an initial inspection. This involved making sure that all recovered cultural materials were accounted for by comparing all bagged items with project field note references and the artifact list prepared by the Deschutes National Forest Supervisor's Office. Provenience cards listing the corresponding item's artifact number and pertinent provenience information were also checked for accuracy. Artifact numbers were created by combining the recovered item's respective test unit designation, level depth and object number (eg., 91-J-15-17 refers to test unit 91-J, level 15, item 17).

Next, all bagged items were sorted into general artifact categories (eg., unifacially- modified and bifacially-modified tools, modified flakes, unmodified flaked debitage, cores, ground stone, polished/edge ground items, fire-cracked rock, bone material, organics, modern-historic material and soil samples). Every item in each category was then analyzed individually. Each artifact was inspected for distinctive morphological, functional and stylistic attributes. Traits such as artifact shape, use wear patterns, breakage patterns and other signs of modification were examined and documented for later classification in the *35KL749, Crescent Lake Site Artifact Typology* (Appendix 1). Designation of 35KL749's artifact types was largely-based on strategies developed for interpreting inferred uses, functions and attributes set forth by Wilmsen (1968, 1972), Loy and Powell (1977) and Odell (1981).

Artifact dimensions, appropriate attribute measurements and material type were also recorded. In cases where features could not be distinguished with the naked eye, a hand-held, 16x magnification spy glass or 30-100x magnification microscope was used. Although most of the artifacts were examined in the condition they were found in, a few required minor cleaning with a dry toothbrush to remove excess dirt. However, every attempt was made to preserve the integrity of the artifacts while being handled. After being examined, each was returned to its designated artifact bag.

After all the objects were analyzed and described, they were organized into specific artifact categories that form the basis of the *35KL749, Crescent Lake Site Artifact Typology* (Appendix 1). Each category represents a formed artifact group or functional tool type (eg., Projectile Points, Knives, Drills-Perforators, Scraper-Gravers, Scrapers, etc.) based on inferred use and/or distinguishable morphological attributes. Each artifact category has been assigned a random two-digit category number (eg., 01, 02, 03, 04, 05, etc.) to help distinguish between each grouping (after Brauner 1976).

Artifact categories have been further separated into subcategories based on subtle similarities and dissimilarites between the specimens (eg., 01-01A-D Basal-Notched Projectile Points, 01-02A-I Corner-Notched Projectile Points, 01-03A-G Side-Notched Projectile Points, etc.). In the case of many projectile point subcategories, the artifacts display stylistic attributes that resemble those of distinctive forms commonly affiliated with northern Great Basin and Columbia Plateau cultural areas. All items classified in the artifact typology (with the exception of flaked debitage and historic materials) have been photographed.

Bags of unmodified flaked debitage were separated from the other artifacts and examined independently. All flakes recovered from 35KL749 were first inspected for signs of use or intentional modification, then counted and classified into lithic reduction stages. The flakes were separated according to distinct type to help determine which stages of biface manufacture and subsequent tool manufacturing sequences were being used at the site through time. Considering that at least 21,533 flakes were recovered from 35KL749, the sheer enormity of the collection dictated that only fundamental flake manufacturing stage classes be distinguished. The classification system used is a modification of those developed by Womack (1977:59) and Flenniken (1987:11):

Class 1: Primary Decortation Flakes
Flakes exhibiting cortex over more than 50 percent of the dorsal surface. Cortex may or may not be present on the platform remnant. The ventral surface exhibits a salient accuminate bulb of percussion, and possibly related undulations, erailure scars and striations.

Class 2: Secondary Decortation Flakes
Flakes similar to primary decortation flakes except that cortex is present on less than 50 percent of the dorsal surface.

Class 3: Primary Bifacial Thinning Flakes
Percussion flakes representing the primary or initial stages of bifacial reduction. Flakes exhibit few dorsal surface scars, are often slightly-curved or twisted in long-section and haves single faceted to multifaceted platforms. The ventral surface may or may not exhibit salient accuminate bulbs of percussion, undulations, erailure scars and striations. These are generally the largest flakes produced during bifacial thinning.

Class 4: Secondary Bifacial Thinning Flakes
Percussion and pressure flakes produced during the final stages of bifacial reduction. Flakes exhibit numerous dorsal surface scars, range from flat to twisted in long-section and have multifaceted platforms. These flakes are smaller, thinner and narrower than those of earlier reduction stages.

Class 5: Nondiagnostic Shatter
Chunks, irregularly shaped fragments and multifaceted pieces of lithic material which lack enough diagnostic attributes to be classified in any of the previous four classes.

Designated artifact types have also been grouped into functional tool categories. By organizing recovered artifact types into categories based on similarities between inferred uses, the possibility and/or relative frequency of particular prehistoric subsistence or economic activities that may have been carried out at 35KL749 can be numerically assessed (Appendix 2). Due to the recent nature (i.e. less than 50 years old) of all historic-era materials found at the site, all modern objects are considered collective evidence of historic disturbance. The following functional tool categories have been designated:

1) *Weapons Systems* (eg., projectile points)
2) *Hide and Animal Processing*
   (eg., knives, scrapers, blades, utilized flakes, awls)
3) *Wood and Bone Processing* (eg., drill-perforators, scraper-gravers)
4) *Plant Food Processing* (eg., ground stone, edge ground cobbles)
5) *Tool Production/Reduction*
   (eg., hammer stones, preforms, cores, flaked debitage)
6) *Campsite Debris* (eg., fire-cracked rock, bone fragments)
7) *Undetermined Function*
   (eg., unidentified unifaces, unidentified bifaces, polished cobbles, manuports, unidentified lithics)
8) *Historic Materials* (eg., modern items)

Special Laboratory Studies

Four specialized laboratory analyses were performed on selected samples from the 35KL749 collection:

X-Ray Fluorescence Spectrometry

The Deschutes National Forest Supervisor's Office submitted 24 obsidian samples on August 23, 1991 for trace element analysis. The investigation was conducted by Dr. Richard E. Hughes at Sonoma State University's Geochemical Research Laboratory in Rohnert, California. The artifacts were chosen from a range of depths within the same undisturbed test unit (eg., 91-E) in belief that they would offer a representative sample of distinct obsidian sources brought to and used by prehistoric groups at 35KL749. Ideally, information gained from lithic sourcing could be useful in retracing the movements and/or trade networks of peoples who visited Crescent Lake. The techniques and results of the analysis are presented in

Appendix 3. A discussion of the x-ray fluorescence findings is also included in the following "Descriptive Archaeology" chapter.

Blood Residue Analysis

Blood serum residue analyses were conducted on nine artifacts by Archaeological Investigations Northwest, Inc. (AINW) in Portland, Oregon. Of the 18 samples submitted, AINW was instructed to choose nine suitable for testing. Three scrapers, two scraper-gravers, two projectile point base fragments and two unmodified, non-tool "control" flakes were selected (Table 5).

Table 5. Tool type and provenience of 35KL749 artifacts chosen for blood residue analysis.

Artifact	Tool Type	Level (Depth)	Strat. Context
91-E-4-1	Side-Notched Proj. Point Base	4 (30-40 cm)	Post-Mazama
91-J-5-1	Corner-Notched Proj. Point Base	5 (40-50 cm)	Post-Mazama
91-J-5-6	*Unmodified Control Flake*	5 (40-50 cm)	Post-Mazama
91-J-7-2	Unifacial End Scraper-Graver	7 (60-75 cm)	Post-Mazama
91-J-15-4	*Unmodified Control Flake*	15 (150-160 cm)	Pre-Mazama
91-J-15-7	Bifacial End/Side Scraper-Graver	15 (150-160 cm)	Pre-Mazama
91-J-15-10	Unifacial Side Scraper	15 (150-160 cm)	Pre-Mazama
91-J-16-2	Unifacial Side Scraper	16 (160-170 cm)	Pre-Mazama
91-L-18-1	Unifacial End Scraper	18 (170-180 cm)	Pre-Mazama

Five of the tested artifacts came from the pre-Mazama component and four were post-Mazama. The purpose for analyzing the two "test" flakes was to have non-tool, control specimens included in the study to ensure the reliability of the testing procedures. Each artifact was tested against bear, bovine, deer, rabbit, rat and sheep antisera in September, 1994. The goal of the analyses was to determine if protein residue of particular animal species hunted or processed by Crescent Lake's prehistoric visitors could still be traced on the sampled artifacts. The methods and results of these analyses are presented in Appendix 4. A discussion of the blood residue findings is also included in the following "Descriptive Archaeology" chapter.

Radiocarbon Dating

One charred wood sample taken from test unit 91-J was submitted to Beta Analytic Inc. in Miami, Florida for radiocarbon dating. The selected sample was one of the largest and "cleanest" organic items recovered at 35KL749. In addition, the sample was found in a relatively undisturbed pre-Mazama soil in the same level (approximately 160 cm below the surface) as a very dense concentration of cultural artifacts. Although testing only one sample would generally be considered less-than ideal, the limited organic pool obtained from 35KL749 meant that only the "best" sample with the highest probability of yielding a relatively-reliable, early date could be used. The analysis was conducted in November, 1994. The procedures and results of the radiocarbon test are presented in Appendix 5. A discussion of the radiocarbon dating results is also included in the following "Descriptive Archaeology" chapter.

Artifact Pollen Analysis

Four ground stone artifacts were examined for pollen and starch granules which may have become imbedded in the tool matrices during prehistoric use (Table 6). These specimens were chosen because they appear to represent a cross-section of ground stone types found at 35KL749. Likewise, each was recovered from a different location and depth within the site.

Table 6. Tool type and provenience of 35KL749 ground stone artifacts chosen for artifact pollen analysis.

Artifact	Tool Type	Level (Depth)	Strat. Context
87-M-0-1	Ground Stone (Metate)	Unknown	Unknown
91-K-5-1	Edge Ground Cobble (Basalt)	4-5 (31-48 cm)	Mazama
88-A-10-1	Ground Stone	10 (90-100 cm)	Disturb. PrM
91-J-17-1	Ground Stone fragment (Basalt)	17 (170-180 cm)	Pre-Mazama

Artifact pollen washes were prepared and collected at Oregon State University's Archaeology Laboratory on August 19, 1994. The collection process involved scrubbing muriatic acid onto the working surfaces of the stone tools with a new, sterilized toothbrush. After vigorously scouring each artifact, the scrubbed surfaces were gently washed with a stream of distilled water. Scrubbing residues and wash solutions were then collected in sterilized jars. The sealed pollen wash containers were sent to Paleo Research Laboratories in Denver, Colorado for analysis.

Although the likelihood of isolating artifact pollen directly associated with occupation of the site was considered to have been greatly reduced by factors such as possible exposure to modern pollen rain and/or possible contamination that could have resulted from poor post-excavation curation and handling practices, the analysis was, nevertheless, conducted in an effort to be a thorough as possible. The subsequent procedures and results of the pollen wash analyses are presented in Appendix 6. A discussion of the artifact pollen findings is also included in the following "Descriptive Archaeology" chapter.

Chapter 7: DESCRIPTIVE ARCHAEOLOGY

Archaeological remains found at 35KL749 can be categorized according to their spatial and temporal positioning in relation to the roughly one-meter thick band of Mount Mazama volcanic ash and tephra that cloaks the surrounding landscape. This pumiceous cleft is especially prominent in undisturbed areas and serves as a natural time marker that separates the site's stratigraphy and associated cultural matierials into distinct pre-Mazama (pre-6800 B.P.) and post-Mazama (post-6800 B.P.) components. Although a number of the locations tested at 35KL749 display varying degrees of stratigraphic mixing and/or disturbance, enough intact stratigraphic and archaeological information has been revealed to prove the site harbors multi-component occupation material that appears to have accumulated throughout most of the Holocene.

35KL749 Generalized Stratigraphy and Geomorphology

Crescent Lake's earliest cultural artifacts can be found beneath the volcanic mantle within a thin, dark brown, sandy to silty loam palesol which extends upward from a rocky floor of glacially-deposited till gravels, rounded cobbles and boulders. A culturally-barren layer of airfall deposits from Mount Mazama's vent-clearing eruptive phase initially capped the pre-Mazama component with between 20-50 cm of "salt and pepper" volcanic ash approximately 6,845 +/- 50 radiocarbon years ago (Bacon 1983; Matz 1991). Two subsequent, closely-spaced climactic eruptions dumped an additional 40-70 cm of distinctive "popcorn pumice" tephra atop the already-buried pre-Mazama profile. Above the Mazama level lies the artifact-rich post-Mazama component. In areas where little mixing has occurred, stratigraphic profiles vary between about 20-60 cm deep and show signs of a weak, brown sandy-to-silty, loamy soil beginning to develop.

Soil analyses and stratigraphic profiles revealed during the 35KL749 excavations suggest that exposed areas closer to the current shoreline tend to display greater mixing than more-sheltered areas located further from the lake margin. Three natural processes may help to explain these differences:

1) Considering that the original lake level was approximately 8.5 meters (28 feet) lower than present, it is possible that areas closer to the lake margin faced greater exposure to heavy winds that led to greater stress on trees, a higher degree of windthrow activity and, ultimately, generations of sediment churning (Brock 1987; Chitwood, personal communication);

2) areas closer to the original shoreline have been subjected to a greater degree of secondary windblown deposition due to winds that sweep across the lake margin and transport water-worn ash and pumice further upslope (Brock 1987); and

3) hydraulic processes driven by the artificial raising of the lake, subsequent natural fluctuations and continual wave action have extensively reworked and redeposited pumice and sediments along present shoreline areas.

Due to the complex nature of 35KL749's terrain and varying degrees of sediment mixing and disturbance, general stratigraphic trends can be better understood by breaking the site down into specific geographic areas (Figs. 14, 15). Although the boundaries of each are somewhat arbitrary and partially-limited by the horizontal extent of testing within the site, ten individual geographic areas have been designated based on common geomorphic and topographic traits:

(1) _Campground Beach_

This area covers approximately 14,250 ft^2 (1,323 m^2) and is located on the northeast corner of Crescent Lake Campground along the shoreline between the dam and the beach zone immediately south and west of the campground boat ramp. Test units excavated in this area (from south-to-north) include 91-P1, 91-P3, 91-P5, 91-I, 91-P6 and 91-A.

Campground Beach Stratigraphic Analysis: All profiles observed in the Campground Beach area are heavily-disturbed and stratigraphically-mixed to great depths. Mixed beach sands, post-Mazama sandy loam, water-worked and redeposited Mazama pumice and historic debris were found throughout each unit. In most cases,

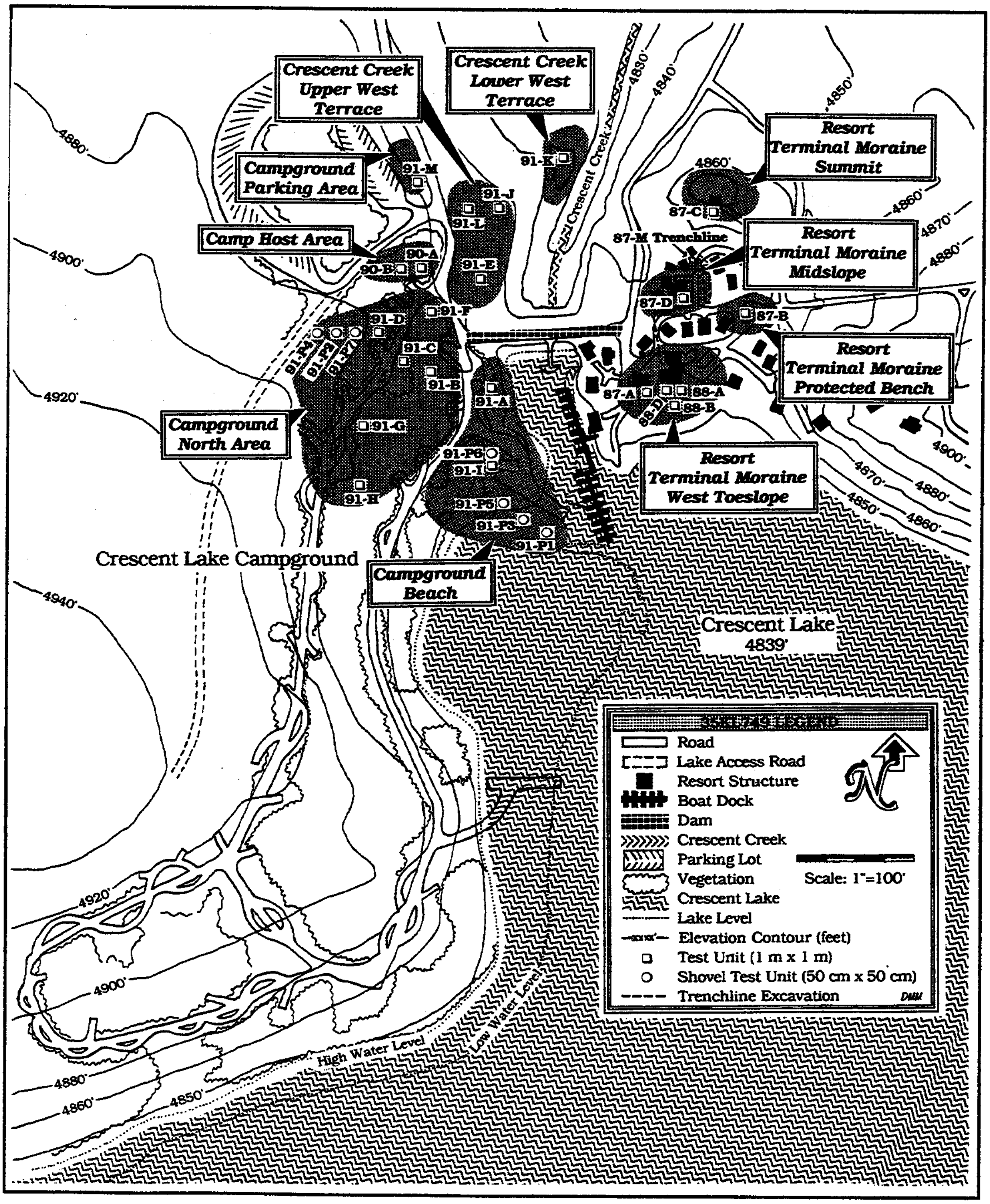

Fig. 14. 35KL749, Crescent Lake Site breakdown by geographic area.

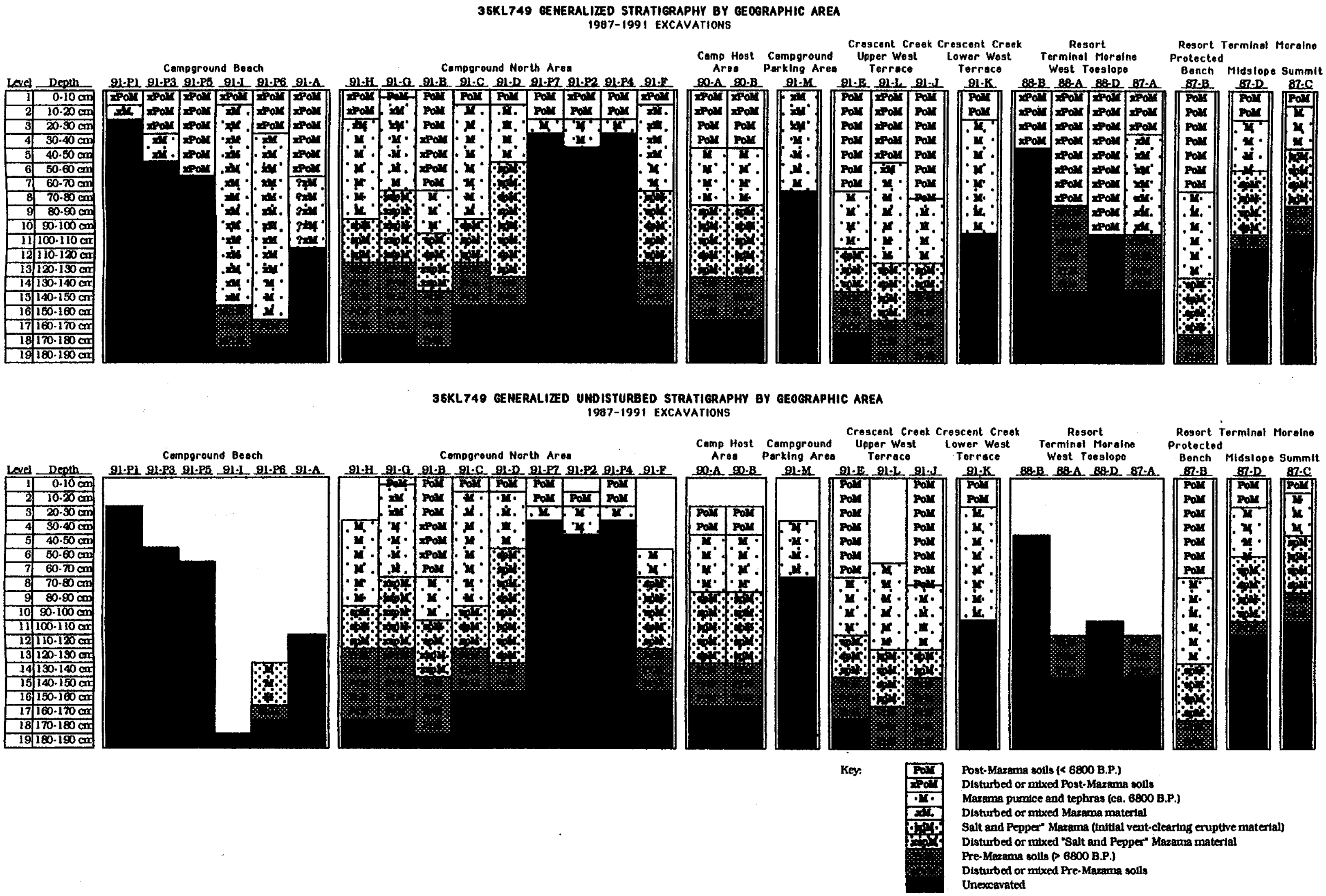

Fig. 15. 35KL749, Crescent Lake Site generalized stratigraphy by geographic area.

no distinct horizon boundaries could be distinguished. Disturbances appear to reach a minimum of 60 cm below the surface, and possibly deeper in particular areas. Most mixing appears to be due to hydraulic action, possible windthrow churning and secondary windblown deposition. The presence of modern garbage and discarded items as deep as 70 cm also suggests that modern recreation activities have greatly affected the stratigraphic integrity of the beach area (see Appendix 7 for a detailed description of each test unit's stratigraphy).

(2) Campground North Area

This area covers approximately 22,344 ft^2 (2,074 m^2) and is located in the northern portion of Crescent Lake Campground on a flat-to-gently-sloping, northeast-trending hillslope between campsite #9 and the Camp Host area. Test units excavated in this area include 91-H, 91-G, 91-B, 91-C, 91-D, 91-P7, 91-P2, 91-P4 and 91-F.

Campground North Area Stratigraphic Analysis: Most test units in this area exhibit relatively-intact profiles with good stratigraphic integrity. Distinct post-Mazama, transition, primary Mazama, pre-Mazama paleosol and glacial till horizons are present. Although minor disturbances are evident in several of the units, most mixing is relatively shallow and limited primarily to the upper 10-30 cm of each profile. Small quantities of modern debris were also found down to 40 cm below the surface in three of the test units. However, the bulk of disturbances appear to be related to root growth, possible mixing due to windthrow uprooting, rodent burrowing and possible frost heave. Surface disturbances and limited organic horizon development are likely related to ongoing campground activities (eg., trampling, camping, ground clearing, etc.) and wind erosion (see Appendix 7 for a detailed description of each test unit's stratigraphy).

(3) *Camp Host Area*

This area covers approximately 2,100 ft^2 (195 m^2) and is located adjacent to the Camp Host site (campsite #1) on a small, flat surface immediately west of the

Crescent Lake Campground entrance at the extreme northern end of the campground. Test units excavated in this area include 90-A and 90-B.

Camp Host Area Stratigraphic Analysis: Both units exhibit good overall stratigraphic integrity. Distinct post-Mazama sandy loam, transition, primary Mazama, pre-Mazama paleosol and glacial till horizons are present. Evidence of surface erosion due to foot travel, slope wash and wind transport extends down to 18 cm in both units. One modern aluminum can pull tab was found in 90-B between 10-20 cm below the surface. Minor rodent disturbances caused by burrowing are also present in the transition and primary Mazama pumice levels of 90-A (see Appendix 7 for a detailed description of each test unit's stratigraphy).

(4) *Campground Parking Area*

This area covers approximately 1,312 ft^2 (122 m^2) and is located immediately north of Crescent Lake Campground on an extensively-disturbed surface between the campground access road and parking area. 91-M was the only test unit excavated in this area.

Camp Parking Area Stratigraphic Analysis: Root growth, wind transport, slope wash, rodent activity and possible trampling associated with foot traffic leading to and from the nearby parking lot has churned and mixed the surface organic horizon to the point that it is almost nonexistent. Loam, loose gravels and Mazama pumice can be found intermixed down to 30 cm below the surface. No distinct post-Mazama and Mazama horizons could be distinguished in this area (see Appendix 7 for a detailed description of each test unit's stratigraphy).

(5) *Crescent Creek Upper West Terrace*

This area covers approximately 5,293 ft^2 (491 m^2) and is located on a flat terrace immediately northeast of Crescent Lake Campground and west of Crescent Creek. Test units excavated in this area include 91-E, 91-L and 91-J.

Crescent Creek Upper West Terrace Stratigraphic Analysis: The stratigraphic profiles revealed in these test units suggest this area may harber 35KL749's least-disturbed deposits. The area is situated on a flat, stable, young lodgepole pine-shrouded terrace that overlooks Crescent Creek to the east. With minor exceptions seen in 91-L (which yielded eight modern glass fragments down to 10 cm, a minor degree of root-growth churning down to about 60 cm in the upper reaches of primary Mazama pumice deposits and the appearance of the pre-Mazama paleosol interface approximately 10 cm deeper than the other two units), each unit contains relatively-undisturbed deposits that may reflect the original thicknesses of Mazama and pre-Mazama layers.

Distinct post-Mazama, transition, primary Mazama pumice and ash deposits, pre-Mazama paleosol and glacial till horizons are present in each unit profile. The influence of wind transport/redepostion, slope wash and windthrow appear to be neglible, although minor sediment displacement due to rodent burrowing and root growth may have occurred in some spots (see Appendix 7 for a detailed description of each test unit's stratigraphy).

(6) *Crescent Creek Lower West Terrace*

This area covers approximately 2,091 ft^2 (194 m^2) and is located northeast of the Crescent Creek Upper West Terrace and immediately west of Crescent Creek. 91-K was the only test unit excavated in this area.

Crescent Creek Lower West Terrace Stratigraphic Analysis: The stratigraphic integrity of this area appears to be fairly good. Wind transport, possible slope wash and sediment movement due to root growth may have affected the upper 10 cm of surface deposits to an undetermined degree. Moderate root growth and rodent activity below 20 cm appear to be the primary sources of potential disturbance below the surface (see Appendix 7 for a detailed description of 91-K's stratigraphy).

(7) *Resort Terminal Moraine Summit*

This area covers approximately 2,500 ft^2 (232 m^2) and is located on the top of the terminal moraine hillslope situated at the northern end of Crescent Lake Lodge Resort. 87-C was the only test unit excavated in this area.

Resort Terminal Moraine Summit Stratigraphic Analysis: The stratigraphic integrity of this location appears to be good. The surrounding area provides natural protection from wind and water action and has probably helped to preserve the original thickness of airlaid Mazama pumice and ash deposits (Brock 1987). Nearby construction activities and road use appear to have caused most of the disturbances in the area, although most impacts are very shallow and limited to the surface (see Appendices 8 and 9 for a detailed description of 87-C's stratigraphy).

(8) *Resort Terminal Moraine Midslope*

This area covers approximately 2,378 ft^2 (221 m^2) and is located on the terminal moraine midslope in the north-central portion of the Crescent Lake Lodge Resort grounds. 87-D and the 87-M backhoe trenchline were the only test excavations in this area.

Resort Terminal Moraine Midslope Stratigraphic Analysis: The stratigraphy in this area has remained remarkably undisturbed. Although ongoing activities at the surrounding resort structures have undoubtedly caused an undetermined degree of surface disturbances, none were documented. The stratigraphic profile observed in 87-D displays primary deposits that represent the original thickness of airlaid Mazama ash and pumice (Brock 1987). Observations of the 87-M trenchline describe a similar undisturbed stratigraphic record. A minor amount of mixing was noted in 87-D at the interface between the Mazama salt and pepper ash horizon and pre-Mazama paleosol, but no particular causal mechanism was determined (see Appendices 8 and 9 for a detailed description of 87-D's stratigraphy).

(9) *Resort Terminal Moraine Protected Bench*

This area covers approximately 1,640 ft^2 (152 m^2) and is located in the east-central portion of the Crescent Lake Lodge Resort grounds on a terminal moraine midslope bench. 87-B was the only test unit excavated in this area.

Resort Terminal Moraine Protected Bench Stratigraphic Analysis: This location is protected from direct winds that come off the lake margin and, consequently, has probably experienced minimal windthrow disturbance. However, the presence of a 70-cm deep layer of water-rounded pumice and ash fragments deposited on top of airlaid Mazama pumice and ash suggests the area has been subjected to secondary wind transport/redeposition of material from the lake margin (see Appendices 8 and 9 for a detailed description of 87-B's stratigraphy).

(10) *Resort Terminal Moraine West Toeslope*

This area covers approximately 4,422 ft^2 (411 m^2) and is located on the west toeslope of the terminal moraine that forms the empoundment for Crescent Lake. Crescent Lake Lodge Resort's main lodge and associated structures are located on this landform. Test units excavated in this area include 88-B, 88-A, 88-D, 87-A and the southern portion of the 87-M backhoe trenchline.

Resort Terminal Moraine West Toeslope Stratigraphic Analysis: Disturbances in this area range from moderate to extreme. In most cases, stratigraphic mixing extends from the surface down to the upper reaches of the pre-Mazama component. The presence of rounded pumice gravels in each stratigraphic profile suggests that winds blowing up from the lake edge have contributed redeposited material to the area. Windthrow potential in the area has always been high and, along with rodent activity, may have helped to amplify subsurface churning (Brock 1987). The discovery of modern debris buried at least 95 cm below the surface demonstrates that modern use of the surrounding resort structures and grounds has also taken a toll on the area's stratigraphic integity (see Appendices 8 and 9 for a detailed description of each test unit's stratigraphy).

35KL749 Artifact Assemblage

A total of 243 stone tool artifacts were recovered at 35KL749. In addition, 21,533 pieces of lithic debitage, one bone tool artifact, various concentrations of charcoal, fire-cracked rock, bone fragments, baked clay, ochre and a single human mandible were found. 1,327 historic (i.e. modern) items were also documented. At least 95 percent of the lithic items are composed obsidian; the remaining stone materials consist of assorted cryptocrystalline silica varieties (eg., cherts, jasper, chalcedony) and andesitic basalt. After all cultural items were thoroughly examined, each was classified as particular artifact type and assigned to a specific artifact category. Descriptions of the artifact types and categories represented at the Crescent Lake Site are listed in the *35KL749, Crescent Lake Artifact Typology* (Appendix 1).

In summary, 35KL749's artifact assemblage consists of the following functional tool types:

Weapons Systems

Projectile Points:

Seventy-two complete or fragmentary projectile points were recovered at 35KL749 (Figs. 16-18). Sixty-nine of the artifacts are made of obsidian and three consist of cryptocrystalline silica. A number of the specimens resemble stylistic forms commonly found in the northern Great Basin (Hester and Heizer 1973; Heizer and Hester 1978; Thomas 1981; Wilde 1985; Aikens 1993:20-43; Oetting 1989, 1994a, 1994b), Klamath Basin (Mack 1982; Sampson 1985) and Columbia Plateau (Leonhardy and Rice 1970) cultural areas. Classification of the Crescent Lake collection is based primarily on hafting element configuration, other morphological traits and inferred weapons system use (eg., spear vs. atlatl vs. bow). Table 7 lists the projectile point types and styles that have been documented at 35KL749.

Table 8 lists projectile point styles common to the adjacent northern Great Basin, Columbia Plateau and Klamath Basin regions, a number of which share similarities with specimens found at 35KL749. Undetermined projectile point styles found at the site are categorized in Table 9. Comparable manifestations may also be present in other areas of the central Oregon Cascades, but such notions cannot be explored within the scope of this discussion. Very-approximate periods of use may be inferred based on typological cross-dating between some Crescent Lake points and morphologically-similar, temporally-sensitive forms observed in adjacent regions.